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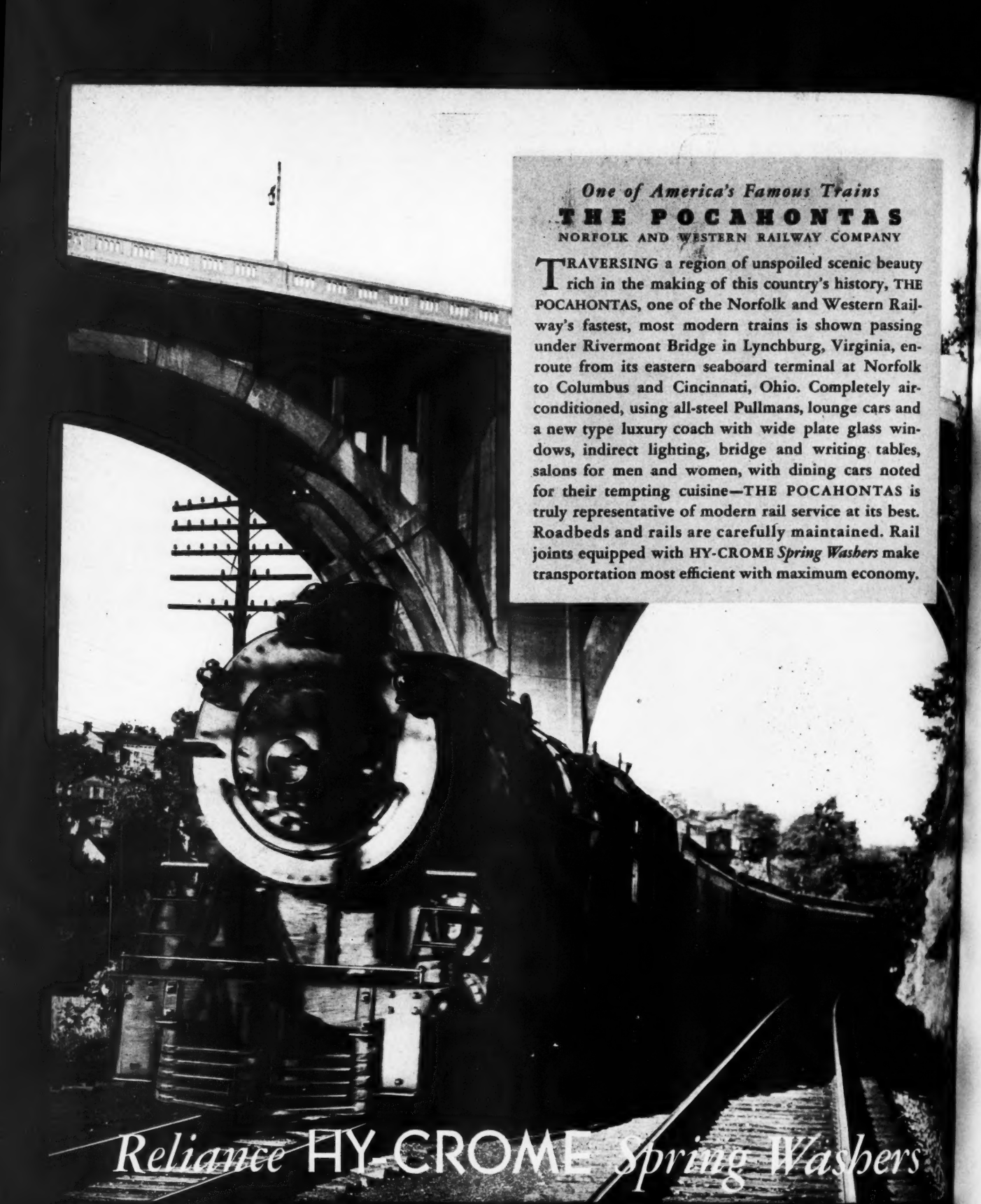

One of America's Famous Trains

THE POCAHONTAS

NORFOLK AND WESTERN RAILWAY COMPANY

TRAVERSING a region of unspoiled scenic beauty rich in the making of this country's history, THE POCAHONTAS, one of the Norfolk and Western Railway's fastest, most modern trains is shown passing under Rivermont Bridge in Lynchburg, Virginia, enroute from its eastern seaboard terminal at Norfolk to Columbus and Cincinnati, Ohio. Completely air-conditioned, using all-steel Pullmans, lounge cars and a new type luxury coach with wide plate glass windows, indirect lighting, bridge and writing tables, salons for men and women, with dining cars noted for their tempting cuisine—THE POCAHONTAS is truly representative of modern rail service at its best. Roadbeds and rails are carefully maintained. Rail joints equipped with HY-CROME *Spring Washers* make transportation most efficient with maximum economy.

Reliance HY-CROME *Spring Washers*

REActive Deflected	THACKERAY	HY-REACTION	STANDARD	HEAVY DUTY	DOUBLE	BOND
Meets A. R. E. A. Spec.	*For screw spike use*	*For track bolts*	*For general use*	*For frogs—crossings*	*For special use*	*Used as*

EATON MANUFACTURING CO. RELIANCE SPRING WASHER DIVISION, MASSILLON, O.

Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

THIS BIG PIPE

"HAS WHAT IT TAKES"

For Dependable Railway Drainage

• Strength . . . durability . . . economy — you'll find all these necessary qualities in Armco Multi Plate pipe. In diameters up to 10 feet and larger, it offers you an ideal solution for trestle replacements, cattle passes and large drainage openings.

STRONG AND DURABLE

Why strong? Because it's made of sturdy ARMCO Ingot Iron plates more than a quarter of an inch thick and formed with extra large corrugations. *Why durable?* Because these heavy duty plates are 3 to 4 times as thick as the same material which has proved itself in railway service for 30 years, to date.

Why economical? Because Armco Multi Plate pipe comes to you "knocked-down" — all ready for quick, easy erection. Your own maintenance crew can assemble the plates and bolt them together without special equipment.

Prove these facts to yourself by using Armco Multi Plate pipe on your next job. You can expect full cooperation from our nearest office listed below.

★ ★ ★

INGOT IRON RAILWAY PRODUCTS CO.

(Member of the Armco Culvert Mfrs. Assn.)

Middletown, Ohio **Berkeley, California**

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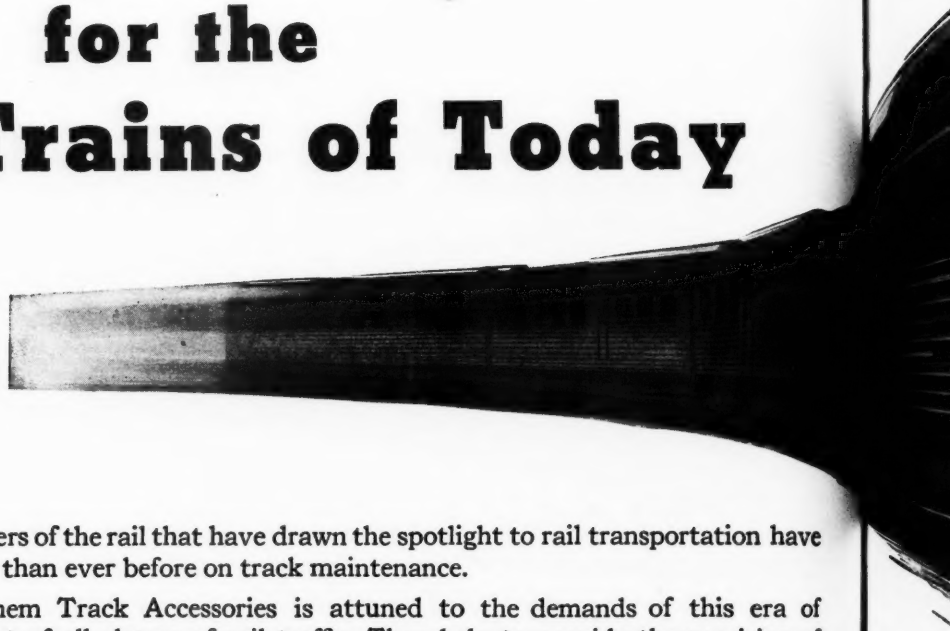
This 105-inch Multi Plate pipe provides an opening for drainage and stock under an important main line railroad.

ARMCO MULTI PLATE

Published monthly by Simmons-Boardman Publishing Company, 105 W. Adams St., Chicago, Ill. Subscription price, United States and Possessions, and Canada, $2.00; Foreign $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the postoffice at Chicago, Illinois, under the act of March 3, 1879, with additional entry at Mt. Morris, Ill., postoffice. Address communications to 105 Adams St., Chicago, Ill.

Better, Smoother Track for the Fleet Trains of Today

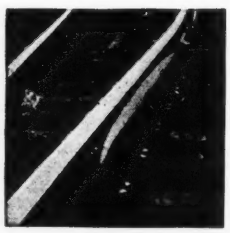


THE LITHE, fleet coursers of the rail that have drawn the spotlight to rail transportation have focused more attention than ever before on track maintenance.

The entire line of Bethlehem Track Accessories is attuned to the demands of this era of increasingly swift movement of all classes of rail traffic. They help to provide the precision of track structure essential to smooth riding of fast, light-weight equipment. At the same time they are built with the rugged strength and resilience to bear up under the multitude of fast-rolling, heavily-laden wheels of freight trains that vie with passenger trains for speed honors. Provision is made for adjustment wherever it will simplify the work of keeping track tuned up.

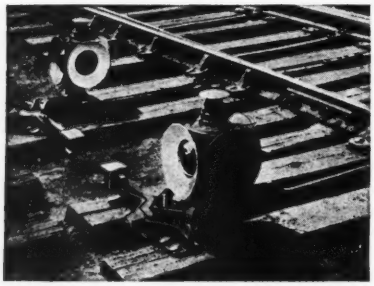
Leading items of Bethlehem Track Equipment are described briefly herewith. Literature giving more detailed information is available on request.

Bethlehem Hook-Flange Guard Rail cushions shocks—spares wheel flanges. The Bethlehem Hook-Flange Guard Rail straightens up fast-moving trucks without great shock, saving wear and tear on both guard rail and wheel flanges.

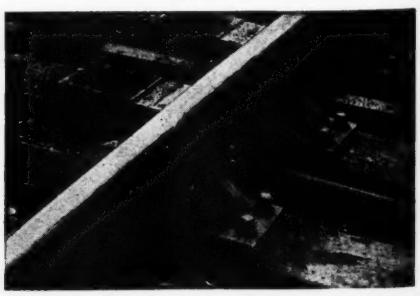


It's the rolled-steel construction of this guard rail that fits it for today's severe service. It yields slightly, dissipating the impact. This guard rail is the safe one for high-speed main-line track.

The New Century Switch Stand measures up to the heaviest main-line switches. The New Century Switch Stand is built to a design proved fundamentally sound through service on leading railways over a period of more than forty years. It has been continually strengthened and improved as the demands upon switch stands have become more severe. Parts made of heat-treated alloy steel provide rugged strength well ahead of present-day requirements.



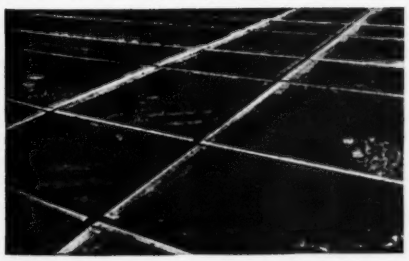
Bethlehem makes other switch stands equally well suited to their fields of service. Among them is Model 1222, an ideal stand to use in yards where sorting and train-make-up requirements call for a stand that can be operated quickly and easily.



Bethlehem Spring Rail Brace provides effective, resilient bracing at turnouts. The Bethlehem Adjustable Spring Rail Brace securely anchors rails against side thrusts. It yields slightly under impact, cushioning shocks, and recovering instantly. The adjustable feature simplifies the work of holding track accurately.

This rail brace is of two-piece construction—a combined switch plate and brace and a spring wedge. It is easily installed and readily adjusted in steps of $\frac{1}{16}$ in. by means of a pawl and slot arrangement, the only tool required being a hammer. The spring, besides providing the resilience to absorb impacts, maintains constant pressure on the rail, preventing vibration from loosening the wedge.

Bethlehem Heat-Treated Crossings reduce maintenance. Bethlehem Heat-Treated Crossings were developed to meet the needs of railroading today. Made of heat-treated rolled steel, these crossings have the combination of strength and resilience needed to stand the pounding of the fast-rolling wheels encountered nowadays. These crossings effectively lower maintenance expenses wherever traffic conditions are rigorous.



Bethlehem Positive Signal Stand raises safety standards. This safety device hooks up the switch points with a distant signal to give warning of any dangerous conditions at the switch.

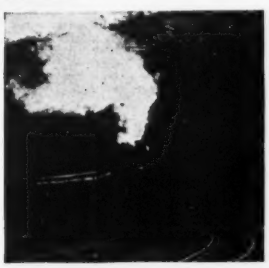
For today's speeds the Bethlehem Positive Signal Stand is a highly desirable supplement to railroad signal equipment. With this stand any switch in track-circuit territory, however remote, can be made as safe as one controlled from an interlocking plant.

The design of this device permits easy installation and ready accessibility for adjustment or inspection. The total assembly is so compact it occupies little more space than the average switch stand.

Bethlehem Gage Rod stabilizes the rail at curves. Bethlehem Gage Rods are the appropriate means of balancing the extra-severe thrusts at curves and switch toes resulting from greater speeds.

These gage rods distribute the thrust over both rails at curves and keep the rails to gage and in precise alignment.

The use of Bethlehem Gage Rods will be found to be an effective means of economizing on track maintenance.



Bethlehem Twin Frog Plates eliminate use of special plates. Bethlehem Twin Frog Plates come in standard 23-in., 26-in. and 28-in. sizes to fit any size frog and any frog angle.

These plates are made of rolled steel with a forged hook that is heavier than a track spike. This hook fits over the base flange of the frog, holding it securely in position under severest service conditions. Each plate is punched to receive five track spikes.

BETHLEHEM STEEL COMPANY

The proof of the pudding is in the eating, so we reprint here a report covering actual performance of

GRIP NUT COMPANY'S BRAKE BEAM SAFETY SUPPORTS

which have made mileage equivalent to over 10 years' service on the average freight car.

[redacted] RAILWAY COMPANY

[redacted]
GENERAL SUPERVISOR AIR BRAKES

[redacted] February 19, 1936.

[redacted]
General Air Brake Inspector.
[redacted]
[redacted]

Dear Sir:

In response to yours of Feb. 4th, file [redacted] regarding the brake beam support manufactured by the Grip Nut Company.

I wish to advise we placed two of these on auxiliary tanks used behind locomotive to increase the water capacity and they have proven very satisfactory as follows:

"The records show that two car sets were applied to water auxiliary cars on Nov. 6, 1933. These cars are in very fast service, making 6,500 miles per month and up until the middle of this month, the cars have approximately 175,000 miles without any repair parts whatever.

"Also on this test, due to the brake shoe not riding the wheel 100,000 miles were obtained before applying new brake shoes. They all wore evenly and were replaced after wearing to 1/4" thickness or down to the steel back."

Referring to your question as to the wear on the rods, you understand that these rods are made of alloyed steel and during this test there was no wear visible and I doubt if there will ever be any depreciable wear on any of the parts.

Trust this is the information you desire.

Sincerely,
[redacted]
Gen'l Supv. Air Brakes.

Note there has been no maintenance expense; further, brake shoe life has doubled. The combined savings effected were greater than the whole cost of the Brake Beam Safety Support and labor of applying it. Specify Grip Nut Company's Brake Beam Safety Support and release on your new cars and on additions and betterment programs.

GRIP NUT COMPANY CHICAGO, ILLINOIS

Smooth-riding comfort at low cost for ***High Speed Trains***

AIRCOWELDED Rail Ends help many roads to achieve the smooth riding comfort for which they have become so noted. The Royal Blue, "crack special" of the Baltimore & Ohio R. R., pictured above, is an excellent example of a smooth-riding high speed train.

Airco Railroad Customers have reduced their maintenance costs to a minimum through the combination of Airco apparatus, oxygen and acetylene, and Engineering Assistance.

AIR REDUCTION
SALES COMPANY

General Offices: 60 East 42nd St., New York, N.Y.

DISTRICT OFFICES and DISTRIBUTING POINTS in PRINCIPAL CITIES

A NATION-WIDE WELDING and CUTTING SUPPLY SERVICE

ALWAYS READY—

TIMKEN-EQUIPPED

Section cars must be ready for action at a moment's notice — swift, sure, dependable action. That is why the leading makes of section motor cars and trailers are dominantly equipped with Timken tapered Roller Bearings.

In the exclusive combination of Timken tapered construction, Timken positively aligned rolls and Timken Alloy Steel car manufacturers and users find full protection against friction; radial, thrust and combined loads; and shock.

Thrust is especially threatening in section car wheels but the tapered rolls and raceways of Timken Bearings take it easily and safely — without the slightest increase of frictional resistance. Make sure your new cars are Timken-equipped. Then you will be assured of long car life, economical operation and low maintenance cost.

Tapered Roller TIMKEN BEARING EQUIPPED

A symbol of quality for any piece of equipment with which it is associated

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN TAPERED ROLLER BEARINGS

ANY KIND OF TAMPING AT A PROFIT!

Because of low initial cost and low hourly operating expense Barco Portable Gasoline Unit Tytampers can handle any kind of a tamping job at a saving.

In spot, gang or single unit tamping this easily handled unit can be depended on to drive ballast under the ties with sufficient force to maintain the rails and points at the proper level. Ample power for crib-busting.

One of the many important advantages of the Barco is—its portability. No large or costly equipment is required to be carried to the job and set up. Each Barco Unit Tytamper is a self-contained and complete unit which one man can carry. Write for latest bulletin of Interesting Facts on Tamping.

BARCO MANUFACTURING CO.
1805 W. Winnemac Ave., Chicago, Ill.

The Holden Co., Ltd.
In Canada
Montreal—Moncton—Toronto—Winnipeg—Vancouver

BARCO UNIT TYTAMPER

Frozen or cemented ballast easily broken up.

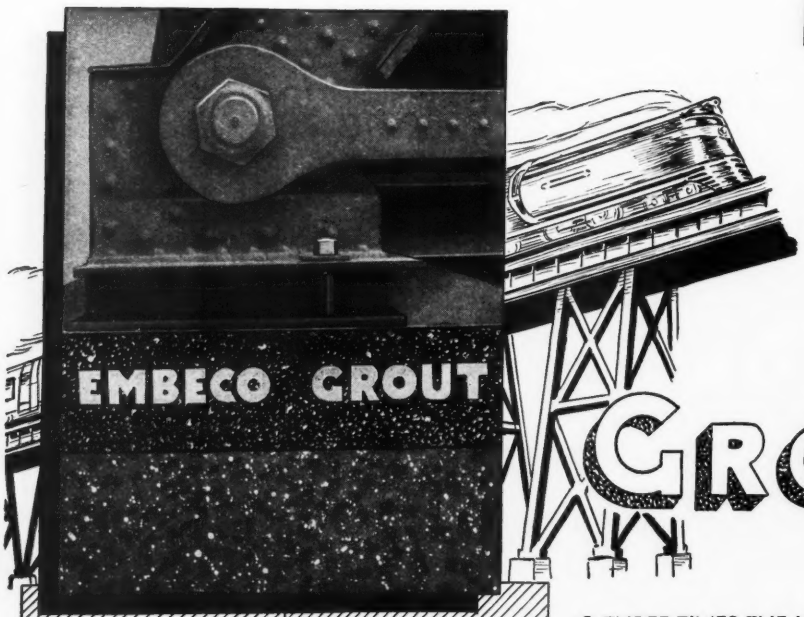
Gangs travel fast—each man carries his own equipment.

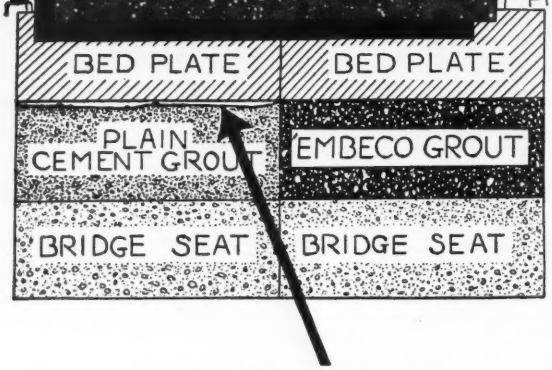
BARCO

AMERICA'S LEADING RAILROADS SAVE MONEY • TIME • TROUBLE with

EMBECO

Non-Shrink Quick-Setting High-Strength GROUTS





• *Shrinkage has been the major cause of ordinary cement grout failure. Poor contact between the grout and bed plate permits increased vibration with resultant rapid wear and disintegration. EMBECO NON-SHRINK creates an ideal bearing surface that stands up thru years of service.*

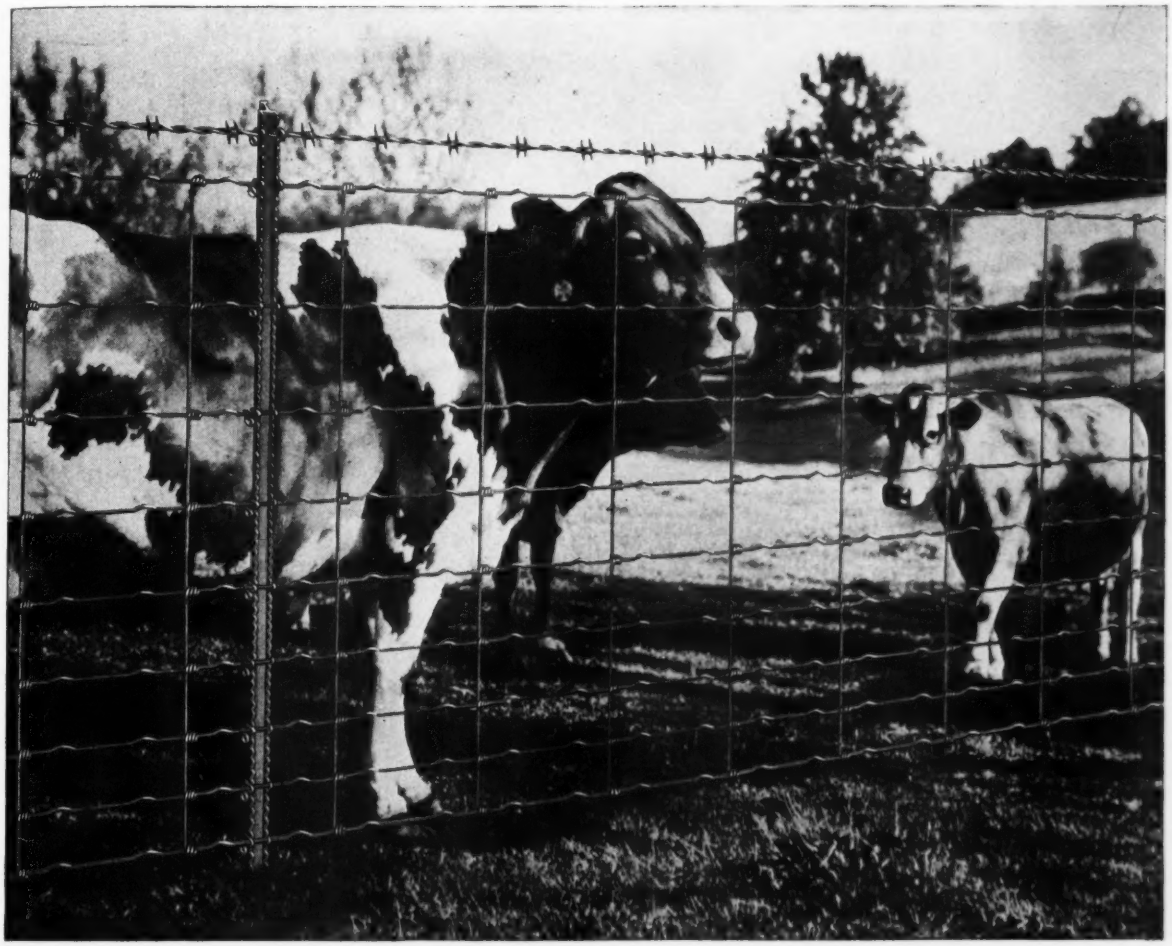
• THREE TIMES THE LIFE OF ORDINARY GROUTS! That's the record of Embeco performance in ten years of use in railroad bridge seat and turntable maintenance. Embeco's unusual advantages, its ease of application, its definitely superior lasting qualities have resulted in its becoming the standard specification for this type of work. Embeco grouts may be placed in use in from 30 minutes to 12 hours after pouring, as conditions demand. When time dwindles to minutes, when traffic must go through, Master Builders Rust Joint Iron is needed. It builds safe, sure grouts in a few moments.

Send for the complete facts on **Embeco.**

THE MASTER BUILDERS CO.
CLEVELAND, OHIO · · · TORONTO, ONTARIO

To reduce stock claims . . .

fence the Right-of-Way



EACH year millions of dollars are spent protecting life and property at crossings, but what about the Right-of-Way?

The best way to reduce stock claims is to fence the Right-of-Way. The most economical protection is offered by American Railroad Fence and Banner Steel Line Posts. These products, including National Expanding Anchor End and Corner Posts, meet all specifications of the American Railway Engineering Association.

American Railroad Fence is made of medium hard wire, tough and sturdy. It is full gauge with rust resisting Copper Bearing Steel. The smooth, evenly coated galvanizing affords a full measure of protection against corrosion. The famous American Hinge Joint gives the flexibility that is necessary to withstand the heavy pressure of live stock. The use of these products is not only insurance against the adjustment of costly stock claims, but protection for life and property. Write for a personal consideration of your problems.

AMERICAN RAILROAD FENCE *and* BANNER STEEL POSTS

AMERICAN STEEL & WIRE COMPANY, *Chicago-New York* · COLUMBIA STEEL COMPANY, *San Francisco* · TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

No. 91 of a series

Railway
Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING COMPANY

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: PERSONAL NEWS, AN INDEX OF RECOVERY

June 25, 1936

Dear Reader:

In looking over the advance proofs of this issue, I was struck with the fact that we are this month running 16 columns of news covering changes in position of maintenance officers, a larger amount of space than has been required for this purpose in any issue since February, 1930. In checking over back issues to ascertain what the demands of this news had been heretofore, I uncovered a trend that I believe will be interesting to you. This trend is evident in the following figures showing the average amount of space per issue that we have devoted to personal news among railway men during the last 7 1/2 years:

1936 (first 7 months) .. 8.6 col.	1934 .. 4.9 col.	1931 .. 8.7 col.
1935 ..... 5.3 "	1933 .. 4.7 "	1930 .. 10.1 "
	1932 .. 6.5 "	1929 .. 11.1 "

To me, these figures comprise an interesting indication of trends. They show, for illustration, the steadily declining number of changes as we descended further into the depression, until the bottom was reached in 1933. They then show a slow but steady increase in 1934 and 1935, and a more rapid increase this year. In other words, when retrenchment was the order, men retained their positions, creating few vacancies; such vacancies as occurred were left unfilled; no new positions were created. Now larger programs are in the making; new positions are again being created; vacancies are being filled; the line of promotion is again open.

We devote a great deal of attention to our news department and especially to changes in personnel, believing that these changes are not only of interest to the older men, but an inspiration to the younger men, pointing out as they do the rungs of the ladder up which men are climbing.

Do you find this department of the paper of interest? Have you suggestions for improving it? Would you prefer that we use this space for other material? Are we covering the changes that occur on your road among maintenance officers of the ranks of roadmaster or supervisor and higher? If not, will you help us by bringing these changes to our attention?

Yours sincerely,

Elmer T. Howson

ETH*JC Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

RAILROAD BUILDINGS SURVEY REVEALS MANY ADVANTAGES OF TRUSCON STANDARD BUILDINGS

TRANSFER SHEDS

PERISHABLE FOOD WAREHOUSES

SHOP BUILDINGS

BUNK HOUSES

PLATFORM CANOPIES

STORES DEPARTMENT BUILDINGS

TIME QUESTION . . . What is the comparison of time of erection of a Truscon Standard Building with other permanent types of comparable size and arrangement?

ANSWER . . . Less time is required because Truscon Standard Units are shop fabricated and delivered to job ready for immediate erection.

DESIGN QUESTION . . . What is the scope of selectivity provided by Truscon Standard Buildings?

ANSWER . . . You can select any type and size of building having any arrangement of doors and windows . . . any kind of sidewalls . . . and any type of roofs including flat, pitched and monitor types.

COST QUESTION . . . How does the cost of Truscon Standard Buildings compare with other types of permanent structures of comparable size and arrangement?

ANSWER . . . Truscon Standard Buildings cost less because all units are shop fabricated on a modern production basis for quick erection with resultant savings in costs of materials and labor.

MAINTENANCE QUESTION . . . How do Truscon Standard Buildings compare with any other types of permanent construction of comparable size in respect to maintenance costs?

ANSWER . . . Truscon Standard Buildings require a minimum of maintenance to insure long life. Custom-built from rust-resisting copper alloy steel units and equipped with a base panel of ENDURO Stainless Steel, every Truscon Standard Building is safeguarded for greatest durability under all conditions.

SALVAGE QUESTION . . . If it is ever required to change the location of a Truscon Standard Building, what is the potential salvage value of the entire structure?

ANSWER . . . Truscon Standard Buildings can be dismantled completely . . . moved to any new location . . . and re-erected with practically 100 per cent salvage value.

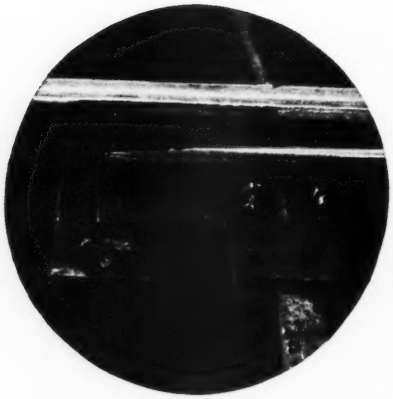
FINANCING QUESTION . . . What arrangements can be made for financing the cost of a Truscon Standard Building?

ANSWER . . . Convenient terms make it possible to spread payments over a period of time that is often sufficient to make a Truscon Standard Building pay for itself from savings in maintenance costs and from profits on the investment.

OTHER QUESTIONS . . . Where quick action is necessary to secure specific information about all details pertaining to a definite requirement, what is the procedure?

ANSWER . . . Write, wire or telegraph direct to Truscon Steel Company at Youngstown, Ohio, if you do not know the location of the nearest Truscon sales-engineering office. (There are 56 Truscon sales-engineering offices located strategically in the United States.)

TRUSCON STEEL COMPANY YOUNGSTOWN, OHIO



Badly worn switch point marked for building-up.

OXWELDING

saves Switch Point Maintenance

● Worn switch points can be made as good as new by rebuilding the worn point with Oxweld MW Welding Rod. The cost involved in this work is only a small fraction of the cost of replacement. Oxweld procedures for reclamation work of this type are effecting great savings for railroads.

The Oxweld Railroad Service Company has developed procedures for all maintenance-of-way welding applications. Oxweld clients benefit by the more than twenty years of experience and research of this organization. The majority of Class I Railroads have been Oxweld contract customers for many years.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
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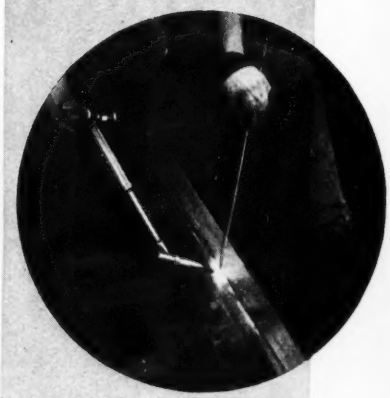
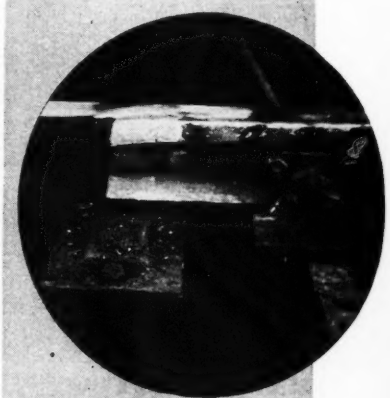
Chicago: Carbide and Carbon Building
New York: Carbide and Carbon Building

OXWELD RAILROAD SERVICE



Oxweld MW Welding Rod is added to the top of the point.

The side of the worn point is built-up.



The finished switch point after reheating and peening.

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

July, 1936

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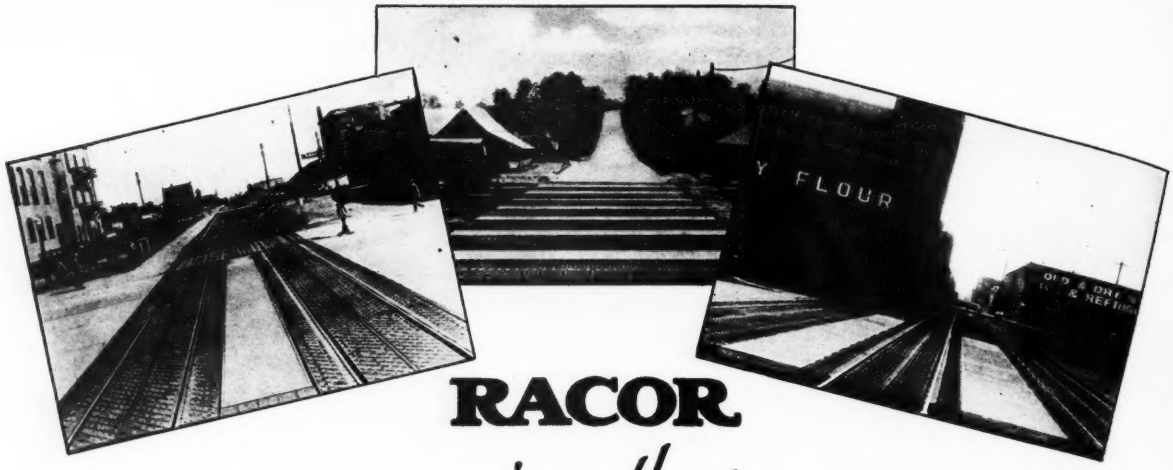

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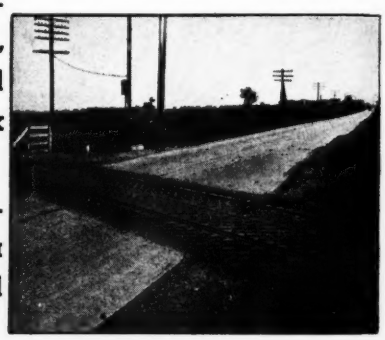

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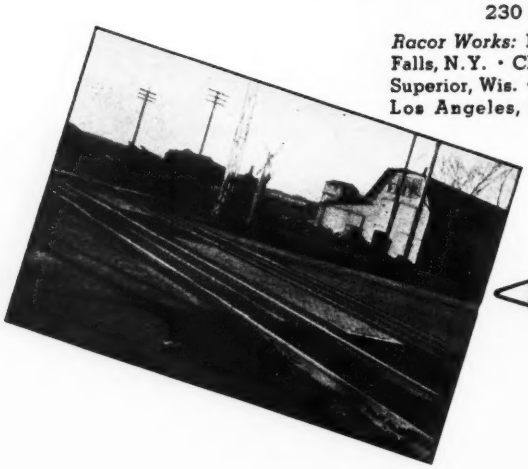

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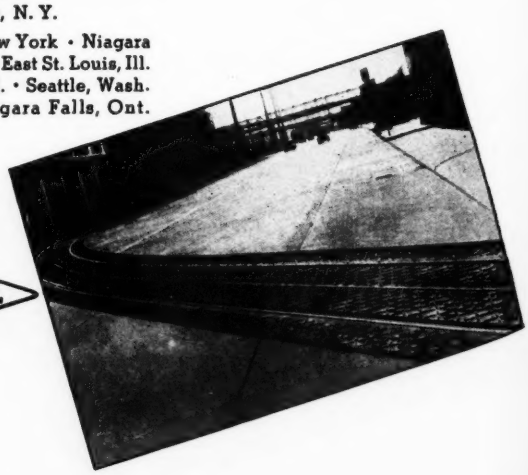


Railway Engineering and Maintenance

Railway Rates

What Is the Trend?

MANY people outside the railway industry—and not a few within the industry as well—are of the opinion that railway rates are increasing or have increased of late years. They recall that the Interstate Commerce Commission authorized increases in rates in the Fifteen Per Cent Class in 1931. They know also that the I.C.C. has just authorized the extension for six months of the surcharge on freight rates for certain products originally made effective on April 18, 1935. From these facts, the impression follows naturally that the general trend is upward. Is this a fact?

Unit Revenues Decline

The units of measurement of service performed by the railways are the ton mile (the transportation of one ton of freight a distance of one mile) and the passenger mile (the hauling of a passenger the same distance). The average revenue per ton mile or per passenger mile is determined by dividing the total receipts for that service by the number of units of that service performed.

In examining such figures it is necessary to start with 1921, because of the readjustment in rates made shortly after the roads were returned to their owners at the termination of federal control, to bring them in line with the new level of operating costs resulting from the wartime readjustment of labor and other costs. In that year (1921) the average revenue per ton mile of the Class I railways of the United States was 1.275 cents; the average revenue per passenger mile was 3.086 cents.

Since that time the average receipts of these railways from all traffic per unit of service performed have declined with almost no interruption from year to year, until in 1934 the average income per ton mile was only 0.978 cents, a decrease of more than 23 per cent in 13 years; it has declined 9 per cent since 1929. Likewise, the cost of service to the passenger declined to 1.918 cents in 1934, a decrease of more than 37 per cent—before giving effect to the two-cent fares placed in effect by the western roads in 1935 and by the eastern roads on June 1 of this year.

In this same period the average haul of freight has increased from 181.48 miles per ton in 1921 to 196.18 miles in 1934—of passengers from 36.03 miles to 40.09 miles. Yet by reason of the proportionately greater decline in rates, the total average revenue received per ton of freight handled has declined from $2.31 in 1921 to $1.92 in 1934, while the average revenue per passenger decreased from $1.11 in 1921 to $0.77 in 1934.

Such figures are contrary to the general impression. For this reason they warrant wide dissemination, as do the conditions which contribute to this fact.

Some of the Reasons

This downward trend of rates is not surprising when one analyzes the situation. It is due to several factors. Foremost is the fact that the railways are in a competitive industry where conditions are arising constantly which require the lowering of individual rates to retain or to secure specific traffic. While the effect of any one such readjustment is small in itself, the cumulative effect of many such changes is appreciable.

Another factor is the fact that the competition of transportation agencies on the highways is most keen on the shorter hauls for which the rates are normally higher than for the long hauls. Likewise, these other carriers compete most keenly for that traffic which carries the higher rates. The loss of this traffic reduced the average rate received from the traffic remaining.

Unlike the trucks and the boats which can change at will to routes that offer prospects of greater volume or more lucrative traffic, the railways are fixed in location and cannot pick up and relocate without serious sacrifice. Theirs is a fixed and permanent relationship.

Shippers Have Interest

This situation illustrates a fundamental consideration which faces the railways in the making of their rates. It is self-evident that the rates as a whole must be sufficiently high to yield a fair return to the railways if they are to continue to provide that degree of service that their patrons require. Yet, on specific commodities, the rates can be no higher than the shipper can afford to pay for their movement or he will not move them. Neither can the rates be higher than he can secure from other transportation agencies for comparable service. On the other hand, there is a large volume of traffic that must move by rail and this traffic must of necessity pay such rates as, with the other income, will enable the railways to function efficiently. Because of this fact, those shippers who use rail service have a direct interest in the success of the roads serving their industries. From the nature of their operations, the railways are dependent on tonnage volume for their success. It is through increased tonnage that shippers can look most successfully for lower average rates.

That railway rates have shown this distinct downward

trend in this period when the wages paid their employees are the highest in their history is a tribute to the efficiency with which employee and management alike are working. It presents a record of which they can be proud. It comprises a service of inestimable value to the shippers and travelers of this country. It constitutes an achievement on which railway employees can afford to lay much emphasis when discussing the transportation question with those with whom they come in contact.

Tie Failures

In General, Causes Can Be Traced

DURING the last three decades intensive study has been given to measures designed to extend the life of ties. Many tests have been made and voluminous records compiled to determine the life of ties under various combinations of conditions. As a result of these efforts their average life has been increased from about 7 years to 20 years or more.

Yet, despite these efforts and the vast amount of information that has been accumulated with respect to the factors which tend to shorten their service life, many ties still fail long before their normal life has expired. Obviously, if this is a situation that is susceptible of correction, the average life of any lot of ties can be increased by applying corrective measures.

In general, the factor causing the largest number of failures is decay, even in treated ties, although treatment is applied expressly to overcome or, at least, retard decay. Most failures occur under the rail, although the danger of decay at this point has been reduced considerably in recent years by the increasing practice of boring and adzing the ties before treatment. Yet this practice is by no means universal, and many premature failures can be traced directly to the fact that the spikes penetrate into the untreated interior of the tie, opening avenues for the entrance of decay-producing organisms.

Although the protective value of tie plates has been fully demonstrated, a surprisingly large number of ties, even on important main lines are still unplated or are provided with plates too small to afford adequate protection. Again, although it is commonly accepted that independently-fastened tie plates conserve tie life, taking the roads as a whole, relatively few plates of this type are in service.

The selection of the woods and types of treatment best suited for the climatic and traffic conditions to be met will increase tie life. The adjustment of the methods and time of seasoning to correspond with the characteristics of the different woods; protection against infection prior to treatment; treatment at the proper time; and the application of anti-splitting devices, are all important measures in the conservation of ties.

None of the foregoing items, and others of comparable importance which might have been mentioned, are within the control of the local maintenance forces. On the contrary their adoption rests more directly with officers of higher rank in this department. On the other hand, many of the means by which tie life can be conserved are within the control of the local forces.

Ties that are broken at the middle or under the rail testify to improper or neglected maintenance. Neglected joints destroy joint ties rapidly. Track that is not kept in surface requires repeated gaging, creating damage that shortens tie life. Pulling ties into the track with shovels or picks; striking them on the sides or ends with mauls or sledges to space or shift them; and redriving spikes without plugging the old holes are only a few forms of abuse to which ties are subjected by trackmen, every one of which definitely shortens their life.

Most of these causes of failure can be easily identified as the tie approaches the end of its life. Some of them are the responsibility of management. Others are the result of improper practices which can be overcome by the right kind of supervision. Since ties constitute the largest single item of maintenance expense, it is worth while to apply the necessary corrective measures, for if only one year can be added to the average life of ties on any road an attractive saving can be made.

Foundations

Nothing Should Be Taken for Granted

NO DUTY imposed on officers in charge of bridge construction and maintenance weighs more heavily on their shoulders than their responsibility for the security of bridge foundations. Most of these officers undoubtedly have reasonable grounds for the conviction that they are fully aware of the critical situations in their territories and that every case of doubtful stability is being carefully watched. But are they sure of this? The railways enjoy an enviable record in-so-far as bridge failures are concerned, but the record is by no means perfect, and defective foundations rank high among the causes of bridge accidents.

More often than not, the conditions that cause anxiety for the bridge maintenance officer are not of his own making. He inherits the results of poor judgment, bad workmanship, or worse, of years gone by, especially in structures on minor lines acquired in the course of consolidations. A contributing factor of uncertainty in such instances is the loss of construction records.

But even where there is every assurance that the foundation work was carried out conscientiously under competent supervision, there is always the possibility of subsequent physical changes that may threaten the security of the structure. Channel changes, dredging operations or other natural or artificial causes may alter conditions that prevailed at the time the bridge was completed.

In these circumstances there is only one answer—take nothing for granted that is capable of any kind of a check. Several articles appearing in these columns during the last year cited the use of a diver in exploring the foundations. Inspection by a diver is costly and under some conditions perhaps none too reliable, but it is to be questioned whether divers have been employed to the extent that is warranted by the information that their services would disclose. The record of the railways with respect to accidents resulting from foundation failures speaks well for the men responsible for the safety of bridges, but every accident is one too many.

Shoulders

An Added Reason for Providing Them

ENTHUSIASM for the use of motor trucks in maintenance operations led one railway officer to suggest the construction of drives on railway rights of way to permit the more effective use of these vehicles in locations where public highways did not parallel the railways. Needless to say, nothing came of that idea, but since it was proposed various types of work equipment have been mounted on crawler treads so that they may be moved and used along the right of way off the track.

Such equipment can readily occupy the ditches in cuts, but its effective use or movement along embankments is possible only where there is an adequate shoulder outside the ballast toe line. The standard roadbed cross-sections of the A.R.E.A. and of the individual railways definitely provide for shoulders, but unfortunately these shoulders sometimes disappear, even on important main lines—repeated ballast raises, or minor raises in grades, without corresponding increases in the roadbed widths, being among the more important reasons for their disappearance. In most cases failure to widen the roadbed has been justified on the ground that it is an unnecessary refinement during periods when expenditures must be curtailed. This policy may be questioned not only on the ground that the width of embankment that affords ample shoulders is necessary for an adequate support for the loads imposed, but also because the shoulders are a necessity where off-track equipment is to be employed.

Welded Joints

How Much Better Than Screwed Joints?

IN RECENT years, numerous applications of welding have been developed which have both shortened the time and reduced the cost of making repairs, or have made it possible to salvage materials which were formerly thrown on the scrap pile and replaced with new. One of the early applications was the substitution of welded for screwed joints in steel and wrought-iron pipe lines. Despite this early application and the demonstrated advantages of welded joints, not a few roads still follow the practice of applying screwed couplings on pipe lines.

While the first cost of a welded joint is somewhat higher than that of a screwed joint, this difference is soon offset by the marked reduction in maintenance. Experience has demonstrated that welded joints are equally adapted for high-pressure and low-pressure lines for steam, air and hot and cold water. The advantages for low pressure lines less than two inches in diameter are questionable, however, except for vacuum-return lines on heating systems, in which case the insurance against leaks will outweigh any question of the difference in cost.

Threads cut into a pipe remove about 50 per cent of the thickness of the pipe wall, thus reducing the strength of the pipe correspondingly. On the other hand, the welded joint does not reduce the thickness of the pipe and tests have shown that, if properly made, it has about 85 per cent of the strength of the pipe itself. This joint has, therefore, a decided advantage for use in hot and cold water lines, since the full thickness of the joint is reserved to withstand corrosion.

Another advantage occurs in the application of lateral connections, since the necessity for cutting and threading the pipe is eliminated. This is particularly true where lateral connections are demanded after the line is in service, as these connections can be made without breaking or otherwise disturbing the line. A further advantage is that cast-iron pipes can be brazed together, and satisfactory connections made between cast-iron and steel or wrought-iron pipes.

The Spot Board

A Most Useful and Flexible Tool

WITH a single exception, all of the tools used in track maintenance have passed through a long period of development to reach their present forms, although in several instances the present designs are almost identical with those adopted by the Roadmasters' Association 43 years ago. This exception is the spot board, which was developed and patented by a section foreman about 1890 in substantially the same form in which it is now used.

The intervening years have shown the value of this device, which today is used almost universally by gangs engaged in general surfacing, whether the lift is being made to grade stakes or "by eye." It is not used as widely as it should be for light surfacing or to give the track a running surface, and scarcely ever for spot surfacing, although some foremen contend that it is of considerable advantage even here.

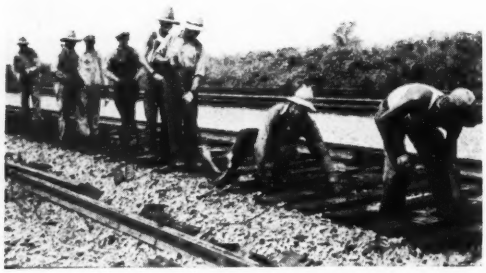
It cannot be denied that a smoother surface is possible where the spot board is used consistently than where it is not. No eye unaided can avoid introducing small iregularities in the surface owing to the limitation and inaccuracy of vision when sighting along the surface of the rail.

It is not intended to imply that the spot board is a substitute for the engineer's level and grade stakes on a major ballasting operation, although one of its important applications is on work of this character. On the other hand, many miles of tracks are given a light running surface every year, on which work no one ever thinks of preparing a profile and setting stakes. It is on this latter type of surfacing that the spot board demonstrates its greatest value. Yet, strange to say, it is on this work that it is least likely to be used.

The fact that the spot board can be used with the same facility on a light or a high lift and with or without grade stakes gives it a flexibility that is possessed by few other tools. For this reason it is as advantageous for the section gang as for the ballast gang. In the interest of better surfacing, supervisors should insist on its use on all but spot surfacing, but they should be sure that their foremen understand thoroughly how to handle it, for there are certain definite rules for its use which must be followed consistnetly or the work will not be done satisfactorily.

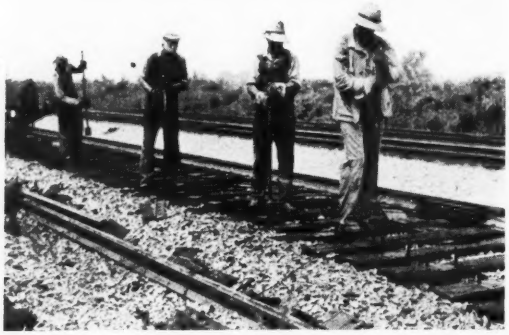
Does Protection End With

Power Spike Puller Used
The use of a power spiker puller is considered important on the Santa Fe as a means of preventing damage to the ties.

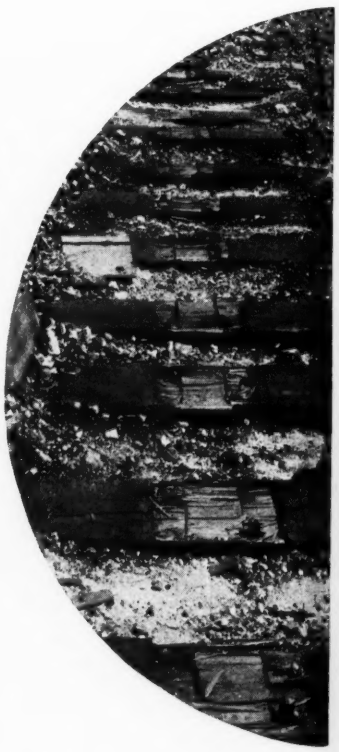


Several Steps in a Good Job
One man removes the old tie plates, the second throws out the old spikes and rail anchors, the third sweeps off the tie, the fourth drives down the spike stubs and he is followed by the men who set the tie plugs.

MECHANICAL injury to the surface of a treated tie or faulty workmanship in the handling of the tie after it has been treated may open the way for the entrance of decay through the treated shell of the wood in such a way that the expenditure made for treatment may be largely or entirely wasted. Recognizing this, the Atchison, Topeka & Santa Fe has adopted practices and standards of workmanship in track work that are designed to insure that injury to ties will be avoided and the maximum possible service life will be obtained. One of the operations in routine maintenance



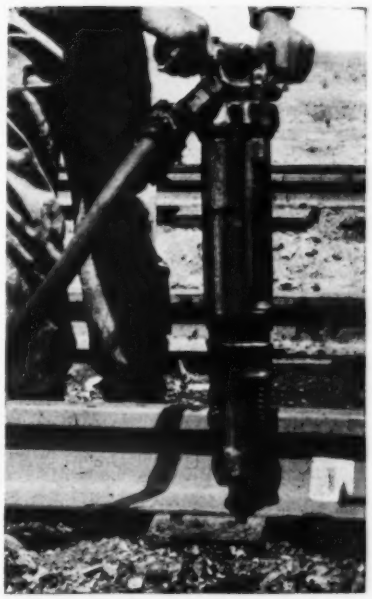
Plugs Must Fill Holes
The Santa Fe insists that the tie plugs be driven home and that all the holes be filled.



Accurate Adzing
To insure a smooth tie-plate bearing the adzing is conducted in three stages. The first machine (not shown) makes a rough cut. This is followed by a second with an intermediate cut and a third that makes the final cut.

# of Ties Treatment?

The answer is "no" on the Santa Fe where the proper handling of ties to avoid mechanical injury and defective workmanship is considered important in obtaining the maximum service life. Particular emphasis is placed on the importance of good workmanship in out-of-face rail laying operations.



Careful Spiking Required
As respiking injures the ties, special pains are taken to render it unnecessary. Power spike drivers are used.

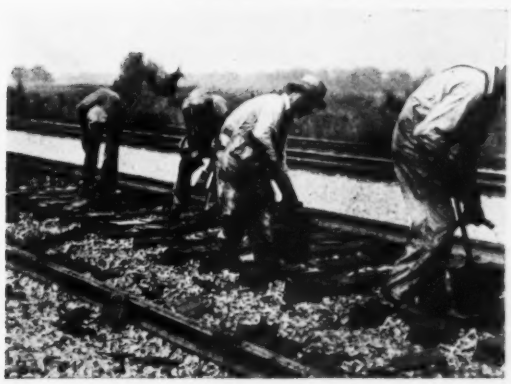
that exerts a direct effect on tie life is the out-of-face relaying of rail for in this work ties may be damaged or weakened by the careless driving of tie plugs, adzing of the ties, placing of the tie plates or the driving of the new spikes. For this reason, the Santa Fe gives special attention to this phase of track work in the application of its tie protection practices.

One of these practices provides for more accurate adzing and the avoidance of excessive adzing of the ties in track, prior to the laying of new rail. As a means to these ends, greater use is being made of power adzers, but with a departure from usual practice in that the work is done in a three-stage process. Three machines are employed, but instead of having each machine complete the cut on every third tie, all three of them work on every tie, the first one making a rough cut, the second an intermediate cut and the third the finishing cut.

This plan was adopted because the perfection in the adzed surface on the tie is dependent on the degree of sharpness of the knives on the cutter head, and the knives are dulled rapidly by particles of ballast embedded in the surface of the tie, as well as by the

Before and After Adzing
Left semi-circle—View of track immediately after old rail and fastenings have been removed and tie plugs have been driven. Right semi-circle—View of the ties after adzing. Note the rail-laying gang approaching in background.

Traveling Supply Service *(Above)*
The mopping oil is heated and the adzer knives are resharpened on a car that is hauled behind the rail crane. One man attends the heater, another sharpens the knives on a power grinder and a third resets the knives.



Protect Adzed Surfaces *(Left)*
Two men mop the tie-plate bearings with a 50-50 mixture of hot cresote-petroleum before the plates are set in place.

occasional striking of spike stubs. Therefore, by operating the adzers in series, the first adzer removes most of the particles that tend to dull the knives, and since it is expected to make only a rough cut it is not so important that the knives be kept so sharp, whereas, the adzer that makes the finishing cut works on a surface that has been cleaned by the first and second adzers and is thereby kept sharp more readily. However, care is taken to insure that the cutting heads are changed often enough to insure a smooth surface, in some cases the heads being changed as frequently as every 15 min. To insure that sharpened cutter heads will always be available, the gang organization includes a man who sharpens the knives on a power grinder.

As the Santa Fe feels that properly driven tie plugs are essential in protecting the tie from decay and spike killing, definite rules have also been formulated covering this operation. It is required, of course, that all spike holes be plugged and that the plugs be driven in as far as possible. To this end it is required that the plugs must be driven to the bottom of the hole.

Special pains are taken to protect the untreated wood exposed in adzing by the application of a 50-50 creosote-petroleum mixture, care being taken to insure that the adzed surfaces are properly swabbed with this mixture and that it is heated to the temperature that will insure the most effective results. About 200 gal. of the creosote-petroleum mixture are used per mile of track.

Other precautions include care in placing the tie plates to insure that they will be square with the rail and centered on the ties, accuracy in gaging and good workmanship in spiking. The practice of correcting crooked spiking by forcing the spike over with a blow against the head is not permitted.

To assist and co-operate with the rail gangs in the application of these standards of workmanship, a representative from the office of the system manager of treating plants visits each rail laying gang from time to time as the work progresses. Chosen for their knowledge of ties and tie preservation and track work in general, these representatives co-operate with the roadmasters and the foremen of the rail gangs in the practical application of tie protection policies. As a major responsibility, these representatives also inspect as many as possible of the ties that are removed from the track for the purpose of noting and tabulating the cause or causes of failure, that is, whether it is due to spike killing, shattering, plate-cutting, decay or a combination of these. Information obtained in this way, together with the results secured from 400 miles of test tracks, is employed by the chief engineer, system, in shaping the tie policy of the road.

Precautions designed to prevent the injury or mistreatment of ties are not, of course, confined to rail laying operations but are applied wherever the conduct of track work involves the handling of ties. For instance, where the ties are being renewed during surfacing work care is taken to insure that the new ties are placed in the proper position and that the tie plates are so centered that the holes in the plates will coincide with the pre-bored holes in the ties and that the V-shaped ribs on the underside of the plate will fit into the corresponding grooves provided in the pre-adzed seat of the tie.

Lining a Tunnel With Precast Concrete Blocks

By M. F. Clements

Bridge Engineer,
Northern Pacific,
St. Paul, Minn.

THE problem of relining railroad tunnels has always been a troublesome one, owing to the difficulties imposed by the necessity of carrying on the work in a limited space without interfering with train movements. With a view to overcoming this difficulty we decided to experiment with the use of precast concrete blocks in repairing short sections of the Northern Pacific's tunnel near Bozeman, Mont. It was felt that this expedient would not only permit the concrete work to be carried on without interference of any sort but, by removing short sections of the old lining at a time and replacing them with the concrete block lining, the use of timber cribbing for supporting the walls and roof of the tunnel in soft material would not be required and the work could be carried on without interfering with regular train movements. The use of precast blocks would also make it possible, if desired, to increase the vertical clearance of the tunnel by increasing the height of the side walls.

The Bozeman tunnel is a single-track bore located on the main line midway between Livingston, Mont., and Bozeman at the summit of the Belt range, a spur of the Rocky mountains. Completed in 1884, the tunnel is 3,652 ft. long between faces of the concrete portals. The material penetrated is a fine-grained blue shaly limestone, unsound in places. Originally 1,457 lin. ft. of timber lining was placed, the balance of the tunnel being in natural rock.

In 1895 the timber lining was destroyed by fire, resulting in a number of cave-ins. Following this fire a permanent lining was placed in the tunnel, traffic during the period of construction being routed over the reconstructed overhead line. The lining consisted of concrete walls about 2 ft. thick, extending the full length of the tunnel, 1,932 lin. ft. of concrete arch ranging from 17 in. thick at the spring line to 11 in. at the crown, and 1,694 lin. ft. of brick ma-

By employing this expedient in relining short sections of its bore near Bozeman, Mont., the Northern Pacific made the necessary repairs with minimum interference to traffic.

sonry arch of uniform cross-section but varying in thickness from 2 to 5 courses of brick. In cross-section the tunnel had a width of 16 ft. between side walls and a height of 19 ft. from the top of the rail to the crown of the arch at the center line. The arch was semi-circular in section and had a radius of 8 ft.

A large amount of water seepage occurs in this tunnel, the action of which, together with that of locomotive gases, has resulted in the disintegration of a large portion of the lining. In an attempt to remedy this condition, a layer of gunite was applied over the affected lining in 1915; however, owing to the extremely wet conditions existing in the tunnel and the difficulty of protecting the green gunite from locomotive blasts and gases, its life was relatively short. Moreover, at some locations the old concrete lining continued to disintegrate, causing the gunite to loosen.

As a result of continued disintegration of the tunnel lining, failure occurred at three separate points in 1928 and 1929, the failed sections ranging from 10 to 15 ft. in length. Pending the application of permanent repairs to these sections, temporary timber bents and lagging were installed to prevent loose material from falling onto the track.

After a careful study of various methods of lining tunnels and of repairing tunnel lining, with particular emphasis on the need of reducing interference to train movements to a minimum, it was decided to utilize precast concrete blocks as the lining material. The blocks that were designed for this purpose averaged about 1 ft. square in longitudinal cross-section and were about 1½ ft. long in tunnel cross-section, thus providing a lining 1½ ft. thick. Four designs of blocks were used. Those used in the walls were rectangular in shape, 12 courses of the blocks being required in each side wall to obtain a vertical clearance at the center line of 20 ft. To effect the transition from the vertical surface of the side walls to the curved surface of the arch, another type of block having one tapered surface was required at the spring line. All blocks designed for use in the arch were tapered on two sides.

For interlocking, each block was provided with a key on one side and a keyway on the other, the direction of the keys with the blocks in position being, of course, parallel with the longitudinal center-line of the tunnel. To facilitate their installation the blocks at the crown of the arch, or key blocks, were each provided with two keyways which were designed to correspond with the keyways in the adjacent arch blocks. These keyways were packed with concrete after the blocks had been placed in position in the arch. All the blocks were placed with staggered joints.

When placing the blocks in the tunnel no forms were required for the side walls but it was necessary to provide support for the blocks in the circular section. This was accomplished by utilizing forms built of rails supporting 2-in. timber lagging. These forms were built in sections, each of which consisted of two rails, one for each side of the tunnel, which were bolted together at their upper ends and braced at their lower ends by means of struts extending underneath the track. The upper portions of the rails were bent, with the bases out, to conform to the curvature of the arch.

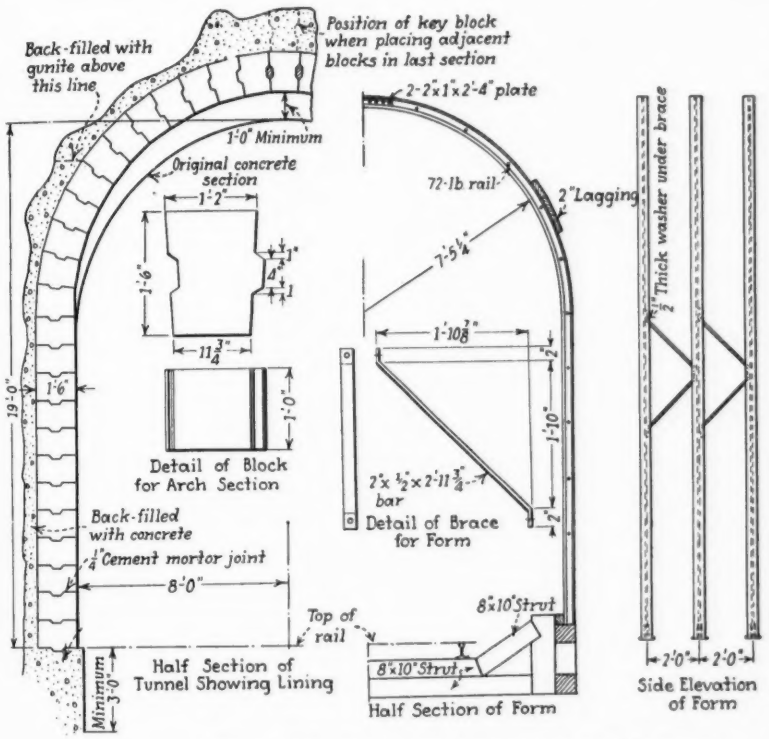
Longitudinally the sections of the form were spaced 2 ft. apart and were tied together by means of 1-in. by 2-in. by 2-ft. 11¾-in. bars placed diagonally between adjacent rails and bolted to the webs, the ends of the bars being bent to the proper angle to provide a flat fit against the webs of the rails. When in place in the tunnel these forms encroach a very small amount on train clearance and in this case the forms were entirely outside of the limited clearance at the temporary timber bents.

The blocks were laid in a ¼-in. bed of 1:3 cement-sand mortar. The space between the back of the blocks and the rock walls and roof was filled with a lean concrete mix, the filling taking place as rapidly as the blocks were placed. For filling the cavity above the last blocks placed in the crown in each section, grout was forced through a 2-in. pipe cast in the center of the last key block placed, one such block being cast for each 10-lin. ft. of tunnel to be repaired. In placing the last key block in each section this block was held above the crown in the space behind the lining during the placing of the last adjacent block and was then pulled down into the final position.

No special equipment was developed for placing the concrete block lining and, in order to eliminate the need for a work train with the accompanying smoke and gases, only light equipment was employed. This consisted of a light timber scaffold having three platform levels, which was mounted on a gasoline car. All work in connection with the removal of the old lining and the placing of the concrete blocks was carried on from the three levels on the scaffold. Pneumatic concrete paving breakers were employed for removing the old lining.

The concrete blocks used in the Bozeman tunnel were precast at Livingston, Mont., a division point located about 11 miles east of the tunnel, and were hauled to the point of installation on flat cars. The concrete was proportioned on the basis of a 1:2:3 mix having a slump of 1½ to 2 in. For 10 days after being cast the blocks were maintained in a damp condition by spraying water on them for about 10 hr. each day. They were cured 30 days before being placed in the tunnel.

Timber forms, lined with galvanized sheet iron and fitted with light plate steel separators, were used for casting the blocks in gang molds. In order to prevent adherence of the concrete to the forms, all contact surfaces of the latter were brushed with a light coat of paraffine oil. For this project forms were provided for casting 60 blocks per day, these forms being used about 25 times for the entire job. The side forms were removed from the blocks about 18 hr. after casting and the blocks were removed from the bottom form about 42 hr. after casting.



Half Sections and Details of the Concrete Block Lining and the Rail Forms

Tools Speed Bridge Repair Program on the Erie

Special repair organizations on the Erie, fully equipped with modern power bridge tools, are completing bridge repairs in a fraction of the time required formerly with hand tools; at a large reduction in expense and with minimum interference with train operation.

THE EFFECTIVENESS, economy and speed which modern power bridge tools and an adequate organization can impart to bridge repair work are demonstrated strikingly in a bridge strengthening and repair program being carried out by the Erie, which includes work on a large number of both truss and girder bridges, and which involves both electric arc welding and riveting. Interesting and improved methods have been in evidence in all of this work, but possibly the most striking speed and economy are evidenced in the plate girder span cover-plate work which forms the major part of the program. In the Erie's program which has been occasioned by normal deterioration, brine drip corrosion, and, more particularly, the advent of heavier power, complete cover-plate assemblies are being renewed and reinforced in approximately half the time required formerly, with largely reduced interference with train operation.

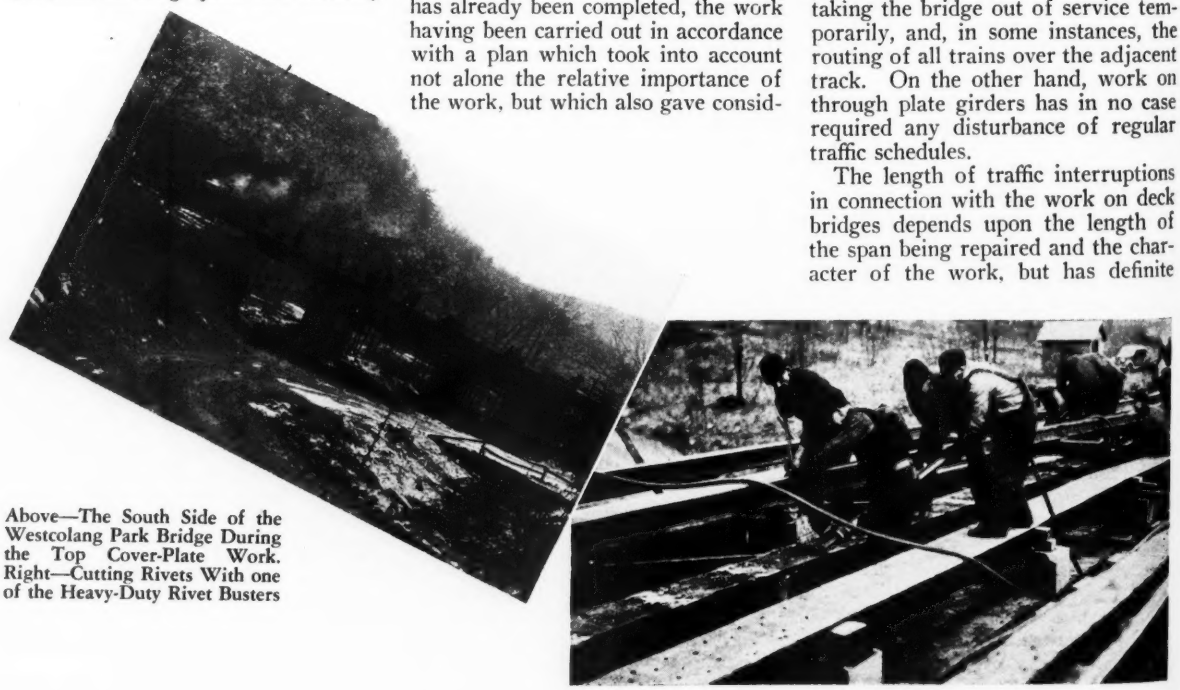
Girder Work

During the summer of 1935, a special program was set up for bridge repair work, which included 27 bridges. Of these bridges 8 were deck plate girder structures, 16 were through girder structures, and 3 were truss structures. Most of this program has already been completed, the work having been carried out in accordance with a plan which took into account not alone the relative importance of the work, but which also gave consideration to all factors which might affect its cost, including traffic conditions, the availability of equipment, and the routine bridge maintenance work of the different gangs which may be involved.

Track Disturbance Cut

The girder bridges included in this phase of the general bridge program are two or more track structures of one or more spans, with span lengths ranging from approximately 30 ft. to 103 ft. In all of these structures, one or more additional cover plates are being added, top and bottom, usually to the existing cover plates, although in a few cases, the old cover plates are being renewed. In each case where work on the top flanges of deck plate girders is involved, the work requires taking the bridge out of service temporarily, and, in some instances, the routing of all trains over the adjacent track. On the other hand, work on through plate girders has in no case required any disturbance of regular traffic schedules.

The length of traffic interruptions in connection with the work on deck bridges depends upon the length of the span being repaired and the character of the work, but has definite



Above—The South Side of the Westcolang Park Bridge During the Top Cover-Plate Work. Right—Cutting Rivets With one of the Heavy-Duty Rivet Busters

Left—Drifting the New Plate Assembly. Below—The Steel Angle Scaffolding Was Bolted to the Side of the Outside Girder Through Rivet Holes

limitations since only in exceptional cases has it been found practical for the operating department to release a track for more than five or six hours at a time. Under even the most favorable conditions, this has been hardly sufficient time to complete in one day a re-riveted cover-plate job on the shorter spans, using former methods with hand tools or the common power tools which have been available, and it has been entirely inadequate to complete work on the larger spans.

As a result, most top cover-plate work on deck girders in the past has required taking the bridges out of service more than once, and a large amount of erection bolting to help carry traffic safely until all of the new rivets can be driven, which had added largely to the expense of the work.

In the Erie's present cover-plate program, the length of time a bridge is taken out of service has been greatly reduced, and only in the cases of the longest spans has it been impossible to complete all re-riveting within the time available for the work. Even in these cases, it has now been found possible to complete the redriving of at least those lines of rivets directly beneath the running rails, making it unnecessary to disturb the track a second time, except for the shifting of a few ties at a time to complete the driving of the rivets in the outer lines.

Power Tools

A number of factors contribute to the rapidity and effectiveness with which the cover-plate work is now being done, the more important of which include the size and character of the organization employed, the attention being given to preliminary phases of the work, and the extensive use being made of power tools to facilitate and speed up the various operations. None of these factors had been overlooked in earlier work, but analysis of the work being done in the present program discloses greater refinement and increased thoroughness in details of each.

Although each of these factors is important, the one that is contributing most largely to the present work is the type of tools being employed and the thoroughness with which the repair organizations are equipped. On sizable cover-plate jobs, the tools and equipment commonly on hand include two types of power rivet busters or cutters, power reamers, power rivet guns, power holder-ons, power impact wrenches, power chipping hammers, rotary wire brushes, hand rivet forges, acetylene cutting and welding equipment, electric welding machines, air compressors, and the usual group of hand tools, including jacks, mauls, chipping hammers, chisels, bars, punches, etc. Of the above mentioned tools, two of recent development, and, incidentally, to a large extent responsible for the increased speed of the present re-riveting work, are the air impact wrenches and one of the types of rivet cutters.

One-Man Rivet Cutters

Since the advent of the power riveting hammer, the speed of most re-riveting jobs has been controlled largely by the rapidity with which the old rivets could be cut off and backed out, and the speed with which the fitting-up bolts could be tightened and subsequently removed. The Erie has long used large pneumatic rivet busters for cutting off rivet heads, and most successfully, but these tools are heavy and their safe and effective use under most conditions involves a crew of four men, while their capacity, large under favorable conditions, is considerably restricted where there are many obstructions or a congestion of operations. With these latter conditions prevailing on many of its bridge jobs, the Erie, in order to secure greater total production and increased production per man hour in removing rivets, has been using effectively a one-man rivet cutter, usually along with the larger cutters, the larger cutters being called upon to do all of the heavier work.

The one-man rivet cutter is a pneumatic riveting hammer, which is fitted with a special safety retainer which holds a cutting chisel. This tool is comparatively light in weight and has a capacity for cutting approximately fifty 7/8-in. rivets an hour. This capacity is far less than that of the larger busters operating under favorable conditions, but under unfavorable working conditions, four men, each equipped with one of the smaller tools, can work more effectively and accomplish greater results than a four-man gang with one of the larger cutters. Furthermore, since the smaller tools can also be used for riveting, a larger number of them can be justified on the job, and the rivet cutting work can be spread out along the girders, avoiding congestion.

Impact Type Wrench

The new air wrenches are of the impact type; are about 20 in. long and weigh approximately 22 lb. Through an air-motor-driven rubber accumulator, they deliver from 1,200 to 1,400 torsional impacts a minute to the nut while tightening or loosening it. While a nut runs free, it is turned up or backed off at a speed of 700 r.p.m. The wrench is easily handled, and its torsional power or ability to draw

pieces tightly together is demonstrated by the fact that it rapidly loosens frozen nuts, and will break the bolt shank if continued in application after the nut ceases to turn. With a single operation, the tool will tighten or back off the nuts of erection or fitting-up bolts from four to ten times as fast as can be done by hand.

Typical Job

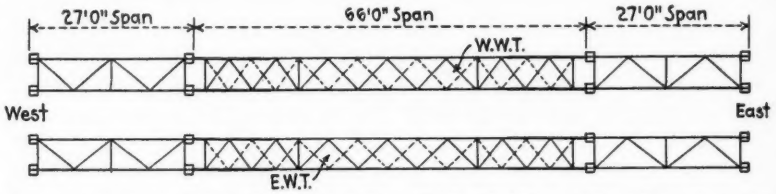
Typical of the more difficult class of cover-plate work done by the road, and of the methods employed in carrying it out, is the strengthening of the girders of a double-track deck girder bridge at Westcolang Park, Pa., which was done early in December, 1935. In this structure, which involves a main span of 66 ft. over a creek and approach spans of 27 ft. at each end, only the main span girders were involved in the cover-plate work, except that both approach spans were raised slightly on their bearings to compensate for the added cover-plate thickness on the tops of the main girders.

The two main girders for each track each had three cover plates, top and bottom, 16 in. wide, ⅜ in. thick, and approximately 34 ft., 46 ft., and 66 ft. long, respectively. The strengthening of these girders by increasing the cross sectional area of the flanges was accomplished by adding two 16-in. by 9/16-in. plates, top and bottom, placing one, 39 ft. 3⅞ in. long, between the center and outer-most existing plates, and the other, 54 ft. 7⅞ in. long, between the center and innermost existing plates.

The plans also called for cutting 11 ft. 11⅝ in. from each end of the existing innermost cover plate of the top flange area of each girder while it was exposed during the work, and replacing the sections removed, which were quite badly corroded, with similar lengths of new plate of the same section. An electric arc butt weld was called for to splice these old and new sections of plate. Likewise, as regards the top flange area, the plans called for filling out the ends of the different plates in the new assembly with full section filler plates of such length that the longitudinal profile of the new assembly would be similar to that of the original assembly, although 1⅛ in. higher, equivalent to the thickness of the two reinforcing plates added. Through this expedient, no alteration of the dapping of the existing bridge ties was required to make them fit the reconstructed flanges, and it was only necessary to replace the ties in their original positions.

Other work called for in this particular job included the renewal of the top and bottom lateral bracing of the main span girders, and the raising of the approach spans 1⅛ in., to conform with the increased height of the main span girders. In this latter work, the approach span girders, which are approximately 2 ft. 5 in. deep, were raised on steel plate shims. At the junctions of the approach and main span girders, the shims were placed on top of existing brackets supporting the ends of the approach spans, and new connections of the girders were effected by the use of specially punched connection angles, which permitted the raising of the approach girders with respect to the main girders without altering the rivet hole punching in either.

In carrying out the repair and reinforcing of the Westcolang Park bridge, the cover-plate work on the girders carrying each track required taking each half of the bridge out of service only once, that being while adding the new plates to the top flanges. No interruption to service was occasioned by the work of reinforcing the bottom flanges. Since the top flange work was considerably more involved and interesting than the bottom flange work, the remainder of this article will deal primarily with the top flange work, and, more specifically, with the work on the two girders carrying eastbound traffic, which was carried out as a unit. The work of reinforcing the top flanges of the girders carrying the westward track was carried out three days later, in a manner similar to that described.



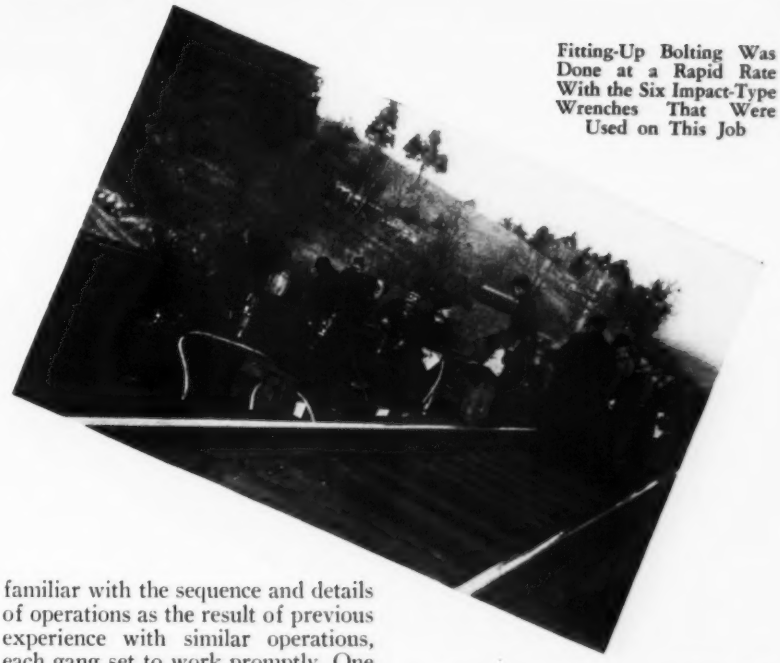
Sketch Plan of the Double-Track Deck Plate Girder Bridge at Westcolang Park, Pa.

Cutting Off the Corroded End of One of the Old Cover Plates with an Oxy-Acetylene Cutting Torch

The preliminary work involved in the top-flange strengthening included first, the construction of a temporary double timber bent beneath the center of the span, designed for both dead and live load. This was done in line with the road's practice of providing falsework support for such work, employing a single bent for heights less than 10 ft. and double bents for heights in excess of this amount. The purpose of this measure is twofold. In the first place, the provision of the temporary bents provides a support for wedging up the girders to minimize dead load stresses and to restore or maintain proper camber in the girders while their reinforced cover plates are being re-riveted, and in the second place, it puts the road in a position, in emergency, to restore traffic (under slow order) to a bridge in minimum time while as little as 45 per cent riveted or bolted.

Following the installation of the temporary center support, the preliminary work included the removal of

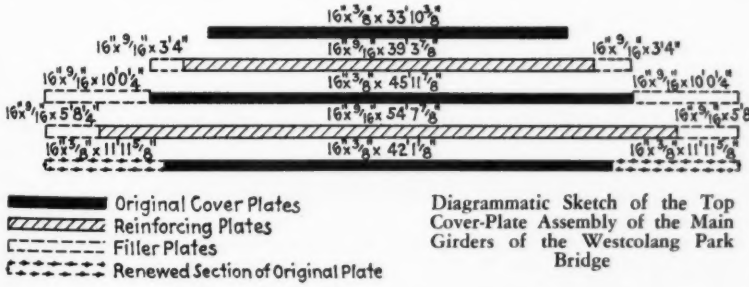
the guard timbers and the guard rails, and every third tie, and the cutting out of approximately 50 per cent of the top flange rivets of each girder. This work also included the erection of scaffolding, the preliminary location of the new reinforcing plates, the removal of rivets from and full bolting of the angle connections of the approach girders to the main girders, and the complete renewal of the top lateral bracing and its hitch plates. In the last mentioned work, the hitch plates were fully riveted to the new bracing members, but were bolted to the top flanges of the girders. All of the preliminary work was done by a single bridge gang, consisting of 11 men and a foreman, under a slow order for trains of 20 m.p.h.



Fitting-Up Bolting Was Done at a Rapid Rate With the Six Impact-Type Wrenches That Were Used on This Job

Top Cover-Plate Work

For carrying out the top cover-plate work, three bridge gangs were brought together and started work at 6 a.m., with full use of the track promised for six hours starting at 7 a.m. The enlarged gang included a general foreman, a foreman, 2 assistant foremen, 1 mechanic or tool maintainer, and 33 bridgemen and helpers. The equipment brought on the job included two 260-cu. ft. single-stage air compressors, 2 heavy-duty rivet busters, 4 refitted rivet guns for rivet cutting, 6 impact-type air wrenches, 3 power reamers, 4 No. 80 rivet guns, 4 pneumatic holder-ons, 4 hand rivet heating forges, an acetylene cutting and welding outfit, a portable oil-burning torch to melt any ice which may have accumulated on the plates, and a full complement of power and hand cleaning tools, bars, jacks, back-out punches, etc.



Diagrammatic Sketch of the Top Cover-Plate Assembly of the Main Girders of the Westcolang Park Bridge

The two 260-cu. ft. air compressors, which had previously been set up at one end of the bridge and arranged in tandem to supply a common air receiver, were immediately put in operation. Many of the first air tools to be used were then warmed by the mechanic over a rivet forge to avoid possible breakage, because the temperature was well below freezing.

Fully organized in advance into special groups or gangs, and fully familiar with the sequence and details of operations as the result of previous experience with similar operations, each gang set to work promptly. One sizable gang, with a push car, began removing the bridge ties; other one and four-man gangs began almost simultaneously cutting the remaining cover-plate rivets, and still other gangs began the work of raising and shimming the approach spans. The track rails were not cut, but were drawn together by block and tackle to afford ready access to the cover-plate areas, and were given support by timber blocking on the top lateral bracing. With the old cover plates fully exposed, cutting and backing out of the old rivets continued rapidly.

Working to a schedule which called for restoring the bridge to traffic at 1 p.m., providing a six-hour working period, it was readily evident that full riveting of the new cover-plate assemblies was out of the question. Therefore, it was the aim within the time allowed, to complete the re-riveting of the two center lines of rivets in each assembly, which lie beneath the rails, bolting up to 50 per cent of the two outside lines, so that the track structure would not have to be disturbed a second time to complete the work. Irrespective of the degree to which it would be possible to complete the cover-plate work, the schedule called for final completion of the work of raising the approach spans, including the full riveting of all connections.

The work as a whole was carried along rapidly on the basis of this general schedule, until about 10:30 a.m., when the period of dead track was extended by the operating department to 4:30 p.m. With this extension, the working schedule and individual operations were adjusted to the end of completing the entire job in the time allowed.

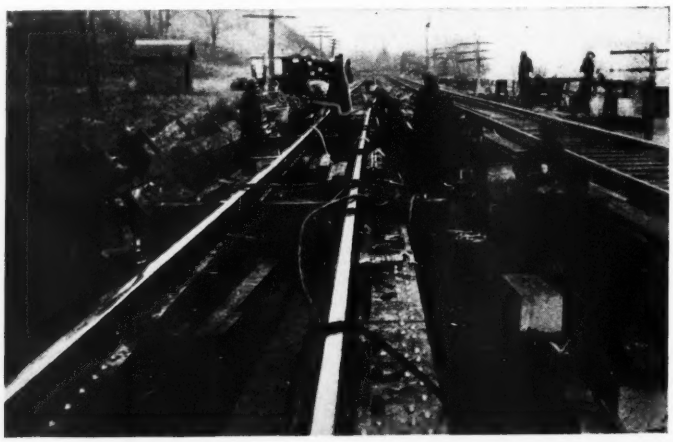
By 7:20 a.m., all track ties had been removed from the span. By 9 a.m., employing two of the heavy-duty rivet busters and three of the refitted rivet gun cutters, and also one of the impact wrenches to remove bolts applied in making the new lateral connections in the preliminary operations, all of the cover-plate rivets and bolts in both girders had been removed. Overlapping this phase of the work, the exposed corroded ends of the old innermost cover plates were cut off by an acetylene torch, as called for in the plans, and the new extension plates were fitted and burned off slightly, where necessary, to insure tight butt joints.

Working on one girder at a time, the two old upper cover plates were then slid sidewise from the top flange on to the scaffolding, and, following the cleaning of the top of the old under-cover with hammers and brushes, the first 9/16-in. reinforcing plate was slid sidewise into place. The old intermediate cover was then restored to position, followed by the second 9/16-in. reinforcing plate and

the old top cover. At the same time, the end filler plates, to maintain the old longitudinal profile of the cover-plate assembly, were placed, and, with the main stress plates, were drifted into proper alinement for bolting and riveting. By 8:55, all plates were in position on the south girder, and by 9:35, all plates were in position on the north girder.

Bolted by 11:15 a. m.

By 11:15, employing only four of the impact wrenches, each with an operator accompanied by a sticker, both cover-plate assemblies had been 75 per cent bolted, involving the placing of approximately 650, ⅞-in. bolts. Forty-five per cent bolted is ordinarily considered sufficient to insure tight fitting-up, but the Erie, on its double-track main line structures, calls for at least 75 per cent bolting in order to insure tight rivets and to be able to restore the bridge to service in a minimum of time during the riveting operations, if for any reason traffic should become blocked on the opposite track. With the adoption and use of the impact-type wrench, this practice has been found entirely feasible, and without appreciable delay to the progress of the work.



Riveting of the New Cover-Plate Assemblies Approximately 50 Per Cent Completed—Note Track Rails Drawn Together to Facilitate the Work

Overlapping the bolting work, four riveting gangs started to work, the first beginning at approximately 10 a.m., and the last at 10:45. Each of these gangs included four men—one riveter, who also drifted each hole; one man heating rivets; one man, who, with an impact wrench, spun off the fitting-up bolt nuts and who also caught and stuck the hot rivets; and one bucker-up, who also removed the fitting-up bolts as released. Power reamers were not used in the rivet holes prior to riveting, as the drifting of each hole was considered satisfactory because of the generally good alinement of the holes.

Although interrupted an hour for lunch, at which time the gang, in two shifts, was carried back to its camp cars in a three-ton motor truck which forms part of the bridge department equipment, all re-riveting of the two girders, that is, cover-plate assemblies and end connections, was completed by 3 p.m.

The finishing-up work included essentially the complete coating, top and edges, of both cover-plate assemblies with ⅛ in. to ¼ in. of No-oxide, and replacing the track ties and respiking the track rails. All of this finishing-up work was completed by 4 p.m. and the bridge was released for service at 4:10 p.m., 9 hr. and 10 min. after it had been taken out of service in the morning. In addition to the large number of fitting-up bolts applied and released in the work, 432 rivets were cut off, 864 rivets were backed out, and 972 new ⅞-in. rivets were driven, within the period.

The bottom cover-plate work on the two girders carrying the eastward track, which included only the adding of reinforcing plates and did not require disturbing the track, was done immediately following the top-flange work. This work, to the point of 75 per cent bolting, was done by one of the three bridge gangs in 1 hr. 30 min. between scheduled trains.

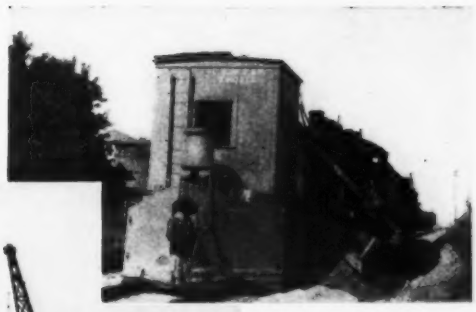
Three days following the top cover-plate work on the eastward track, the timber bent from beneath that track had been moved to the westward track, and, with the preliminary work out of the way, the top flanges of the two girders carrying this track were reinforced. This work, which was done by the combined gangs in a manner exactly similar to that described in connection with the eastward track, required 8 hr. 30 min. Again, immediately following the top-flange work, the bottom flanges were reinforced between scheduled trains by a single gang, and, with full riveting, the strengthening of this double-track bridge was complete.

In addition to the many interesting features of the Erie's work on deck plate girder bridges, there have been unusual and interesting features in connection with its work of strengthening and repairing through girder and through truss bridges. One of the most interesting features in connection with through girder bridges arose with two such bridges, each 103 ft. long, where two girders carry double track. Here, to avoid interruption to traffic, minimize the amount of temporary falsework necessary, and to avoid the necessity of cutting out all flange rivets at one time, the top reinforcing plates were furnished cut longitudinally through the center, and were applied one-half at a time. Thus, at all times, one side of each flange was fully riveted. In the case of one of these bridges, the reinforcing added included angles as well as plates, the angles being applied outside the cover plates.

Of the three through truss bridges being strengthened by the Erie, two are riveted structures, in which cases, such members as are being strengthened are being reinforced with plates attached to the original sections by electric arc welding. In the case of the other bridge, which has pin-connected trusses, the members being strengthened are being reinforced by the addition of adjustable loops around the pins.

The work being done on the floor systems of both the through girder and truss bridges is mostly of a nature which requires only the reduction of the speed of train movements over the bridges during the working hours of the day. In the case of only three of these bridges have cover plates been added to the top flanges of stringers, which required the shifting of the track ties temporarily to do the work. A considerable part of the repair and strengthening work on the floor systems of the through bridges is being done by attaching new material by electric arc welding.

All of the bridge repair and strengthening work on the Erie was planned and is being carried out under the direction of Geo. S. Fanning, chief engineer, and F. A. Howard, engineer of structures, represented in the field by Carl Kohler, shop inspector. The specific job at Westcolang Park, described, was in direct charge of William Baumann, general bridge foreman. The impact wrenches used on this job were furnished by the Ingersoll-Rand Company.



This article is abstracted from a report of a sub-committee of the Committee on Maintenance of Way Work Equipment of the American Railway Engineering Association, which was presented at its recent convention. It contains a discussion of the best means for obtaining a fair return on the investment in work equipment; for insuring the minimum of repairs; and of avoiding costly delays to the maintenance forces due to neglect or misuse of power machines.

Work Equipment—

How to Select and Train Operators

THE necessity for increasing production in track maintenance to meet the requirements of modern train operation, particularly of greater wheel loads and increased speed, has resulted in the use of heavier rail and a general improvement in the standards of track construction.

The use of heavier material and the necessity for obtaining a more uniform quality of track adjustment has created a demand for power machines to supplement manual labor. To supply this demand, power tools and equipment covering a wide range of utility have been produced, particularly during the last 10 years. The extent of the use of power equipment will be appreciated from the fact that the American railways now have $100,000,000 invested in such equipment. The responsibility for obtaining a fair return on this investment should receive the careful consideration of all officers under whose direction work is undertaken.

While it is evident that the greater the use obtained from a machine the greater will be the return on the investment, it is equally obvious that the annual upkeep costs will also be greater. Again it is self-evident that to obtain the full use of equipment, systematic methods of handling repairs must be established. The ideal method of machine maintenance is that of scheduling general overhaulings at stated periods and keeping running repairs in the field to the minimum. To obtain this result it is necessary that proper care be taken of the machine when in use and while idle.

It seems hardly necessary to point out that repairs which are caused by neglect or misuse are not only costly in themselves, but that untimely breakdowns while work is going on may cause expensive delays through disorganization of the forces. As an illustration of the possible loss from

this cause, a fully power-equipped rail gang may contain as many as 200 men. The breakdown of a single machine may delay the entire force. If the delay lasts only 10 min. it will cost approximately $15 in lost wages, or the equivalent of renewing 375 ft. of rail, at $0.04 per ft. Numerous other instances might be cited of definite losses and also of those less tangible losses due to interference with traffic.

We may assume that railroads in general have provided supervision and have established means for taking care of general overhauling. The problem then becomes one of keeping down the cost of depreciation and running repairs through proper care and operation of the equipment. As this is a matter that is largely in the hands of the operators of the machines, the study of this feature is considered essential.

In the selection of men for these positions, omitting consideration of mental, moral and physical attributes, which are essential in all employees, the primary qualifications are natural mechanical aptitude, orderliness about machinery and ingenuity. The first of these qualifications is practically indispensable. Orderliness is a very good indication of the service that can be expected from the man and the equipment in his charge. Ingenuity may perhaps be better defined as the happy faculty of adaptation in an emergency. Maintainers are usually selected from the ranks of operators and, in general, will be found to owe their promotion to the outstanding possession of these three qualifications.

At present, owing to scarcity of employment, much greater care can be exercised in the selection of men for any position than has been possible in the past. It is important that proper selections be made at the outset, for in many cases the existence of craft agreements, basing transfers and promotions on seniority, renders it difficult later to adjust matters of improper selection of men.

The general use of automobiles, trucks, tractors and similar equipment has resulted in a more widespread knowledge of the fundamental principles of machine construction and operation than formerly. It is quite natural that possession of slight knowledge should create a desire for further information. This is particularly true in the case of the mechanical arts, and the result has been the establishment of manual training schools and courses throughout the country. Thousands of boys have had this type of instruction, and no doubt many of them are available and would be glad to fill positions as operators, if the job is made permanent and the wages reasonably attractive.

We may assume that the maintainer has sufficient knowledge and experience to be able to operate and maintain all equipment and tools under his jurisdiction. His training is largely a matter of personal instruction on the part of the supervisor of work equipment. He should be schooled thoroughly in the instructions issued by the railway for the care and use of equipment and, in addition, should be thoroughly familiar with the instructions and parts lists issued by the manufacturers of each machine that he has to maintain. He should be encouraged to visit, when conveniently located, the manufacturing plants of the makers of his machines, to improve his knowledge of the quality of materials used, the assembling processes and other useful information.

Problem Entirely Different

The problem of training equipment operators on a railway is entirely different from that at an industrial plant. At the factory, the instructor is in constant touch with the beginner and can continue his attention until the man is adept in the operation and care of the machine. In fact, when machines of the same type are numerous, and are being put into service at the same time, it is possible to conduct classes of instruction until the new men become capable operators. It is seldom that a railway installs many similar units simultaneously, and even when this is done the machines are likely to be distributed at widely separated points. As the cost of sending the prospective operators to a central point for training is prohibitive, the problem then becomes one of local instruction by the maintainer.

As the maintainer must continue his other duties, the time that he can devote to instruction is limited, for which reason personal attention must be supplemented by other means. Quite often there is an experienced operator on the local territory who can be used as instructor at very little added expense. Again, many manufacturers maintain a staff of service engineers who are readily available for this purpose. In general, primary instruction is not difficult, the real problem being that of securing uniformity of operating practice and care in maintaining the equipment

To obtain these results, it is first necessary to formulate rules of standard practice and exercise proper supervision to insure that the instructions are followed. Practically all equipment manufacturers publish instructions governing the use and care of their machines. This information should be incorporated in the railway's own instructions concerning the use of equipment. It is customary, for practical purposes, for the railway to consolidate the individual machine instruction rules in a single publication, or rule book. However, there is considerable variation in practices, some being based on sound principles while others are founded on fallacious theories.

The extent of the railway's investment in roadway work equipment requires the establishment of systematic methods for protecting that investment, and securing the maximum return on the money involved. To obtain this result it is recommended that:

1. Proper care be given to the selection of prospective operators.
2. The appointment of an operator should be preceded by placing him with an experienced operator for a period of training. During the training period he should familiarize himself with that portion of the manual of instructions that pertains to the particular machine until his qualifications are proved by means of an examination by the maintainer.
3. Division and other officers directly responsible for the use of work equipment should thoroughly familiarize themselves with the contents of the manual of instructions to the end that they may be able to supervise compliance with the rules.

Typical Heavy-Duty Main Line Tracks on the Eastern District of the Erie

Motor Cars

Improve Gang Organization

on Argentine Railway

Studies to effect an increase in the efficiency of the maintenance of way forces of one of the railways of Argentine pointed to the desirability of replacing the section gangs with floating gangs assigned to larger territories, but efforts to adopt this plan did not prove fully successful until all of the gangs were equipped with track motor cars.

WHILE the introduction of section motor cars on the railways of North America was attended by some lengthening of sections, the concerted movement for a reorganization of track forces did not get under way until about five years ago, although the changes being made are possible only because motor cars are used. In Argentine, on the other hand, the Buenos Aires Great Southern and the Bahia Blanca & Northwestern (which is operated by the former) have recently carried out a project for the motorization of their track forces for the primary purpose of effecting a complete change in the organization of the gangs, efforts to carry out such changes without the use of track motor cars having proved only partially effective.

The conditions calling for a change in the gang organization, the difficulties encountered in the earlier efforts to modify the existing plan, and the plan finally adopted were described in three articles by F. L. Creswell, engineer in chief, Buenos Aires Great Southern, that were published in the Railway Gazette (London). The following is an abstract of Mr. Creswell's articles, American railway terminology having been substituted for the English terminology used in the original.

The Buenos Aires Great Southern and the Bahia Blanca & Northwestern form a network of lines over the southern portion of the Province of Buenos Aires, Argentine, with one arm extending westward from Bahia Blanca to Zapala, and another southward from the same point to Patagones. The track maintained amounts to 6,540 miles, of which 5,560 is main tracks and 980 miles is side tracks and yards. The gage is 5 ft. 6 in. throughout. Of the main tracks, most of which are single track, 75 per cent are laid with 85 to 100-lb. rail and the remainder with 74 lb. and lighter sections. Some 68 per cent of the mileage is ballasted with earth, but the remainder, comprising the more important lines—from Buenos Aires to Bahia Blanca, to Mar del Plata, and to La Plata—are ballasted with stone or shell throughout.

There are 531 stations on the system, the distance between stations—except in the vicinity of Buenos Aires—ranging from 7½ to 15 miles. Before the reorganization of the forces there was a section headquarters at practically every station. The section gangs consisted of from 6 to 12 men, mostly immigrants from Central or Southern Europe. The towns at most of the stations are small, and owing to the difficulty in obtaining food supplies, the railroad provided each gang with a cook who was under the supervision of the foreman.

"Horse Trolleys"

For purposes of transportation, the small fixed gangs were formerly provided with a hand car or a "horse trolley," an allowance of $6 to $18 per month being made to the foreman for the provision of a horse or horses to haul the latter. The horse trolley afforded a slow and cumbersome means of transportation, especially when crossing cattle guards or waterlogged mud ballast, and as a result the hand car was the more common means of transportation. Apart from the fatiguing nature of this form of transportation, especially if the journey was against adverse grades and winds, there was more or less resistance on the part of the men, because they were required to travel to and from the work on their own time. A considerable amount of time was lost to the company, due to late arrival of the gangs and to the men resting on reaching the site of the work.

Until the general introduction of farm machinery, the harvest season lasted from two to three months, and created such a demand for men that the gangs were frequently short handed during this period. And as the gangs were small, reductions from this cause or from illness often left them without enough men to pump the hand car. In these circumstances, there was a tendency for the gangs to engage in work at or near the station that was not always of greatest utility.

On the Guido-Juancho-Vivorata branch, where there are few houses at the stations and where the quality of the water is poor, great difficulty was experienced in maintaining an adequate force, and in 1922 a new type of organization was subjected to trial. Three small gangs in this territory were replaced by a floating gang that was provided with a camp-car outfit, these cars being moved from station to station as the work demanded. Later, other gangs of the same type were formed. With this system it was possible to retain sufficient men during the harvest season and it was found that the gangs did more efficient work and were super-

vised more readily. It was also possible to exercise more discrimination in the selection of the foreman. In view of the success of this trial, the system was further extended until, in 1931, 93 floating gangs had replaced the section gangs on the less important branches.

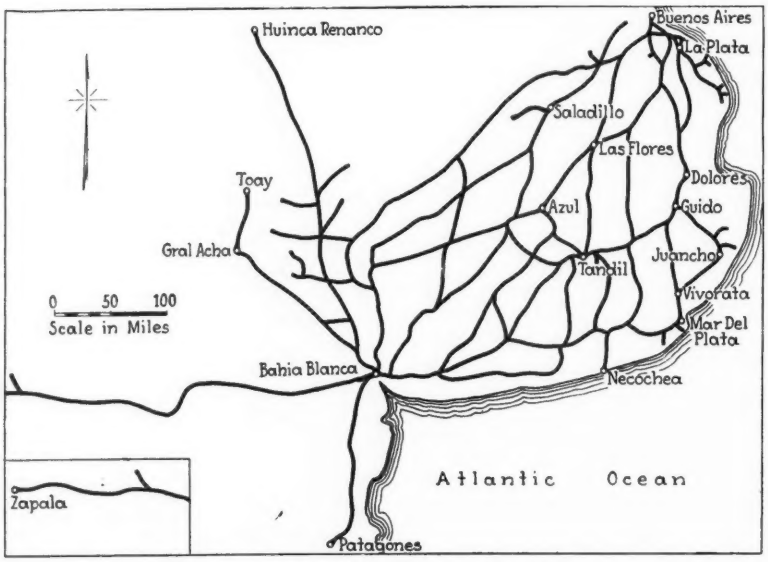
Disadvantages

These floating gangs, however, had several disadvantages, chief among which was their lack of mobility, which necessitated the employment of a track man for general patrol duty at each of the stations. Difficulty in moving the gangs arose from the fact that the transportation department invariably insisted on spurring out the bunk cars in order to release the sidings, and this necessarily delayed the transfer of a gang from one station to another. Delays were incurred also in having the freight trains pick up and set out the camp equipment. Because of these difficulties, it was not deemed advisable to apply this type of organization to the more important lines.

To overcome these difficulties, 10 of these gangs were equipped with motor cars in 1931 for an 18-months' trial, and as a result of the satisfactory experience with these 10 gangs it was decided to reorganize all of the track forces outside of the terminals at Buenos Aires and Bahia Blanca. This included the abandoning of all of the remaining section gangs and the equipping of new and existing floating gangs with motor cars.

To carry out this plan it was necessary to provide 204 cars, but after further experience it was found possible to extend the territories of certain of the gangs, with the result that only 182 cars were required. Of this number, 163 are in regular service while 19 are retained as spares for replacements. Although the motorizing of other gangs is under consideration, the 20 surplus cars have been transferred to the Buenos Aires Western to permit their immediate use in connection with a similar reorganization of the maintenance forces on that property.

The 163 gangs now employed are assigned territories generally 25 to 38 miles long, although it has been found convenient to extend the length to 50 miles on a number of branches. The number of men per gang varies from 12 to 18, depending on the condition of the line and the density of traffic. These gangs are housed in the buildings that were formerly occupied by the section forces, supplemented by wooden bunk houses. The gang headquarters are located as near as possible to the center of the assigned territories, but preference is given to stations where schools, medical service and other facilities are available.



Map of the Buenos Aires Great Southern System

The introduction of motor cars and the adoption of longer sections has resulted in a reduction in the number of gangs from 496 for the fiscal year of 1928-29 to 232 at the present time, of which 69 are not provided with cars. The surplus foremen—married men in nearly all cases—are being employed as "track-revisers" (for patrol duty or spot maintenance) or as supernumerary foremen until such time as they reach pensionable age or are otherwise absorbed.

The rate of pay for the track maintenance forces is low, good men remaining only until they can find more remunerative work. As it is from these men that the foremen are recruited, many of those in charge of the smaller gangs were mediocre. As a result, only the more energetic and competent foremen were retained as the number of gangs was reduced and the majority of the surplus foremen will never again be placed in charge of gangs. To encourage promising men to remain in the gangs for future advancement, they are given the position of first "peon" at a higher rate of pay.

Among the advantages of motor-car-equipped gangs is their ability to arrive at the work punctually and unfatigued. Another, is the readiness with which the gangs are moved to the site of emergency work or to different locations where spot maintenance may be necessary. The new system is also much more elastic, as it is possible to reduce the gangs during the summer months, when less track maintenance work is necessary, and increase them when required for heavy maintenance or special work without increased transport facilities, the living accommodations being so arranged as to provide for these increases.

Better supervision is being obtained by the inspectors, especially those provided with light inspection cars, and it is now possible to record the work done by each gang in diagrammatic form. These data on performance, together with the data on track conditions obtained with the Hallade track recording instruments have led to further developments toward the reduction in the cost of maintenance. The number of men employed in 1932-33 is about equal to the number in 1912, although the line mileage now maintained is 55 per cent greater, while a comparison of 1932-33 with 1928-29 shows a decrease of 30 per cent.

Motor Cars Satisfactory

The motor cars used by the gangs have proved very satisfactory in service after a few minor alterations. They are powered by air-cooled two-cylinder V-type engines of from 170 to 200 cu. in. displacement, with a friction and chain drive to a sprocket on the rear axle. Two types of cars are in service, one having a longer chassis than the other. The longer model weighs 1,200 lbs. and has a seating capacity of 10, while the other weighs 1,170 lbs. and seats 8 men. The cars are inspected periodically by four traveling mechanics, each of whom looks after some 40 cars, and the adjustments and minor repairs that they make systematically have resulted in a maximum of efficiency of the equipment.

By providing a limited stock of re-

pair parts and a few spare engines, that are shipped promptly to the gang foremen in the event of breakdowns, it has been possible to avoid the delays that would be experienced if the repairs were all made at a central shop. However, the cars are overhauled at intervals of 18 months in the maintenance of way repair shop, under a program for the replacement of worn parts, removal of carbon and the painting of the chassis.

Each gang is furnished one or two trailers, which were converted from old hand cars by providing a coupler and a free-wheel device to disconnect the handles from the axles. By a ready adjustment of this device, the trailers can be used again as hand cars. Thus far, only 15 light inspection cars have been purchased for the inspectors or supervisors. These cars are all equipped with engines of 55 cu. in. displacement, the first lot having single-cylinder engines and the second lot two-cylinder engines. As these cars have been in use only since 1933, no definite conclusions have been reached concerning their merits.

No difficulty has been experienced in securing safe operation of the motor cars. Each morning the foreman notifies the station master to what point he is proceeding with his car and inquiries as to the operation of any extra trains. At the same time, extra trains are advised as to the locations at which gangs are working and the engineman is required to keep a lookout for the cars. In addition, on those stretches of the line where the visibility is poor on account of curves in cuts, the foreman is required to use a portable telephone by means of which he can inquire of the nearest station or the dispatcher as to the proximity of trains before placing his car on the track.

Bethlehem Opens New Strip Mill at Lackawanna

ON JUNE 30, the Bethlehem Steel Company formally opened a new continuous strip mill at Lackawanna, N. Y., which is capable of producing 600,000 tons of steel sheets or thin plates per year by the continuous strip process. The sheets turned out by this mill range from a width of 18 in. and a thickness of 0.05 in. to a width of 60 in. with a maximum thickness of 0.0625 in. and a width of 72 in. with a maximum thickness of 0.078 in. Similarly, the product ranges from hot-rolled self-annealed sheets to annealed cold-rolled sheets with polished surfaces, and embraces grades for all purposes to which sheet steel is applied. The continuous strip process affords better control of quality and effects a material reduction in the cost of production, compared with the single-mill process that entails the arduous manual handling of the metal through the successive passes.

The new plant at Lackawanna embodies facilities designed to accommodate all phases of the process, from the storage of 10,000 tons of slabs as they are received from the blooming mill, to warehouses for the storage and shipment of the sheets and plates. The slabs are heated in three gas-fired furnaces with a capacity of 165 gross tons per hour that deliver the steel at a temperature of 2250 deg. F. After passing through a two-high 24-in. scale-breaking stand and being sprayed with water at 1000-lb. pressure to remove the loosened scale, the slab passes, in turn, through four four-high roughing mills that reduce it to about one-fifth of its original thickness, or to somewhere from ⅝ to 1¼ in.

The slab is then held on an intervening roller train until its temperature has dropped to from 1900 to 1950 deg. F. Then, after passing through a second scale-breaking stand it passes progressively through six four-high finishing rolls that reduce it to the finished thickness desired.

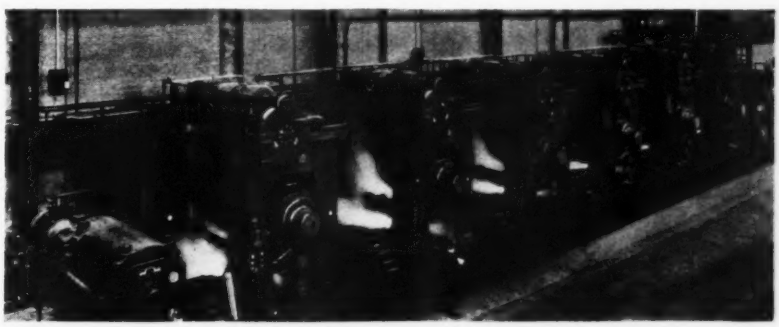
With the reduction in thickness at each succeeding pass, there is a corresponding increase in length in both the roughing and finishing trains. Consequently an essential element of the continuous process is a progressive speeding up of each succeeding set of rolls to avoid the buckling or looping of the strip between mills. This is done by means of an electrical control system that is so accurate as to avoid either buckling or pulling. Because of this speeding up, the strip leaves the last holl at a speed as high as 1352 ft. per min., depending on the amount of reduction in thickness.

After leaving the last finishing stand the strip is either cut to the desired sheet lengths by a "flying shear," synchronized to the speed of the strip, or it is wound up like a ribbon in a coiling machine. The sheared sheets are mechanically stacked for self-annealing or are pickled and normalized, depending on the purpose for which they have been made.

The coiling of the strip is done primarily to facilitate its further processing. This embraces a continuous strip pickling process to remove impurities from the surface, and additional rolling in the cold strip mill, where the metal is subjected to a further reduction in thickness of about 60 per cent on a train of three four-high mills with very hard rolls.

Following this, the product of the cold mill is placed in annealing furnaces, either as coiled strips or flat sheared sheets, and after the completion of this process, which lasts several days, the sheets or strips are given a slight tempering reduction by two stands of skin-pass mills that also produce a highly polished surface.

The plant facilities include the necessary shears for squaring up the sheets and slitters for cutting strips into several strands, as well as means for bundling the material for shipment and the necessary accommodations and equipment for effective laboratory control of the product.



The Six-Mill Finishing Train, Scale Breaker at Left

First Aid in Heat Prostration*

By J. R. Gardner, M.D.

Chief Surgeon, Atlanta & West Point, the Western Railway of Alabama, and the Georgia Railroad; also Chairman, Medical and Surgical Section, A.A.R.

SUNSTROKE, sometimes referred to as heat stroke, is dependent upon the direct action of the sun's rays in creating a disturbance of the heat-regulating mechanism in the brain, and should not be confused with heat prostration. Heat prostration, heat exhaustion, heat cramps or "the bends," as the condition is called variously, develops in persons exposed to excessive external heat, particularly if humidity is present, while exerting considerable physical effort. It is noted in miners, stokers, firemen and others whose occupations require exposure to such conditions.

How it is Caused

Heat acts upon the skin, producing a dilatation of the superficial blood vessels, thereby causing an increase in the supply of blood at the surface of the body, accompanied by a corresponding loss of body heat by radiation and conduction. The sweat glands are stimulated to increased activity so that more water is excreted from the body in the form of intense perspiration, the evaporation of which dissipates even more body heat. It has been estimated that under conditions such as are being considered, as much as three or four quarts of water may be carried from the system in the form of sweat in 24 hours.

Sodium chloride or common salt is a constituent of the body tissues, the blood and perspiration. With the increased and prolonged sweating attendant upon work under strenuous conditions and in overheated surroundings, a large amount of salt is abstracted from the tissues and carried off from the body in the perspiration. Drinking freely of water, as most workers do under these conditions, replaces the fluid excreted as sweat, but makes no accounting for the amount of salt lost in the same way. This loss of salt is the prime factor in the production of heat prostration which has been considered by competent observers to be actually a condition of "water-poisoning."

May Come on Suddenly

The symptoms may come on quite suddenly, so that the patient will show signs of collapse and develop intense cramping pains in the muscles of the abdomen and extremities; or they may come on gradually, beginning with a feeling of nausea and weakness, followed by dizziness, more or less stupor, pallor, profuse perspiration, diminution in the quantity of urine, a rapid pulse and respiration and a lowering of the blood pressure, and later the muscular cramps appear.

The treatment of these conditions is threefold:

1. Prophylactic or preventive. Since the occupation and surroundings cannot be altered, and the effect of these is to abstract salt from the body, the preventive measure lies in supplying additional sodium chloride to the workers. Many industries supply laborers who are exposed to excessive heat, with water containing from one-fourth to one per cent of common salt. Others place a machine for dispensing salt tablets in close proximity to the drinking-water supply and urge employees to take one of the tablets, which contain about 15 grains of salt.

2. First aid. A person manifesting symptoms of heat prostration should be removed to cool surroundings and kept in a recumbent position. Tight clothing about the neck and abdomen should be loosened. The face may be bathed with cool water. Water containing salt in the proportion of approximately a heaping teaspoonful to a quart may be given freely by mouth. A physician should be summoned at once or prompt arrangement made for transferring the patient to a hospital.

3. Treatment. For a long time, owing to the fact that the condition was not understood, it was customary to administer hypodermic injections of morphine for relief from the cramps, which returned as soon as the effect of the drug subsided. Prompt relief is obtained by intravenous injections of saline solution, repeated when necessary, and the administration of water, cooled to about 50 deg. with salt added, by mouth. A strictly milk diet should be maintained for at least 24 hours. Rest, warm baths and, occasionally, sedatives, complete the treatment.

*This discussion was submitted for publication in What's the Answer department, but because of its scope it is presented here as an independent article. For further discussion of this subject see page 430.

Freight Train Hits Motor Car

A HEAD-ON collision between a section motor car and a freight train on the Southern at Jackson, Ga., on November 20, resulted in the death of the section foreman and the injury of an apprentice foreman. According to the report of the Bureau of Safety, this accident resulted from failure to provide flag protection while operating the motor car around a curve. The evidence indicated that the section gang, consisting of the foreman, an apprentice foreman and three laborers, had been working all day about two miles north of Jackson, at a point where the alinement was very crooked and the view limited. The foreman had obtained a line-up of trains at 8:05 a.m., but none later, although a subsequent one had been issued by the dispatcher and placed at Jackson at 1:35 p.m. showing that train No. 50, a northbound freight train involved in the accident, was called to leave Macon, Ga., at 2:30 p.m., about 1 hr. 30 min. late.

Upon completing the day's work, the motor car and a trailer were placed on the track and pushed north to pick up some tools. The gang then returned to the point where it had last worked to load some additional tools and started south toward Jackson. After running about 300 ft., train No. 50 was observed about 20 rail lengths away. The car, which was running slowly, was stopped and an attempt was made to remove it from the track, but by the time the rear end could be pulled around it had been struck.

In his review of the accident, W. J. Patterson, director, Bureau of Safety, stated that although the foreman had not obtained a line-up of train movements since 8 a.m, he undertook to proceed without flag protection through a territory where the view is quite restricted, in violation of rules which require that motor-car operators must not only obtain written line-ups from the dispatcher, but must also provide flag protection around curves where the view is so restricted as to endanger safe operation of the motor cars. It was his conclusion that the accident resulted from the operation of a motor car and trailer, without flag protection, on the time of an overdue train.

Unemployed Get Jobs on Railways in Canada

THOUSANDS of men in Canada, until recently housed in unemployment relief camps by the government, are now being given employment on routine maintenance of way work on the Canadian National and the Canadian Pacific railways, at government expense, under a recent act of the Canadian Parliament and agreements entered into with the two railways. The men being given employment, which it is expected will number 10,000 early in July, are supplementing the regular summer maintenance forces of both roads, and will be continued in the employ of the roads until the late fall. For the payment of the wages of the men, the government has appropriated $3,100,000.

The act giving employment on the railways to those on government relief had the three-fold purpose of relieving the government of abnormally high labor relief camp costs; of providing normal constructive work on a prevailing wage basis for the many unemployed single men in the Dominion; and of assisting the railways in catching up on unavoidably deferred maintenance of way work. During the discussion of the measure in the House of Commons, C. D. Howe, Dominion Minister of Railways and Canals, pointed out that the relief camps established by the government, which have been housing between 10,000 and 20,000 men, had cost the country $9,000,000 during the last year, a sum far out of line with the results accomplished. He said that it was in view of this situation that the government wanted to close out the camps, and, seeking a substitute for them wherein the men could work under proper supervision in organizations capable of employing them under good conditions and with adequate equipment, approached the railways to secure assistance.

The railways advised the government that each of them during 1936 could use effectively in maintenance of way work approximately 5,000 men more than they could actually afford to employ, or would employ, under present conditions. This meant that 10,000 men could be taken from the camps, put to effective work on the railways, and all, or practically all, of the camps abandoned. From the standpoint of the government, it was calculated that if the government were to pay the wages of the men, estimated at $3,100,000, the men formerly on relief would not only be taken care of adequately at a saving to the government, but that the railways, in addition to expenditures for their normal programs, would be called upon to spend additional large sums for supervision, supplies and materials, which would still further stimulate industry and employment.

Under the agreements between the government and the two railways, which are identical, each company agreed to increase its program of maintenance of way work so as to furnish employment for approximately 5,000 men from the relief rolls. The government agreed to reimburse each of the railways for wages paid to the men employed, up to the sum of $1,502,450, and, in addition, to loan each railway, upon request, money necessary to defray other labor expenses which it may have to meet in connection with programing and carrying out the work to be done by the relief forces. These loans are not to exceed $554,700 to each road.

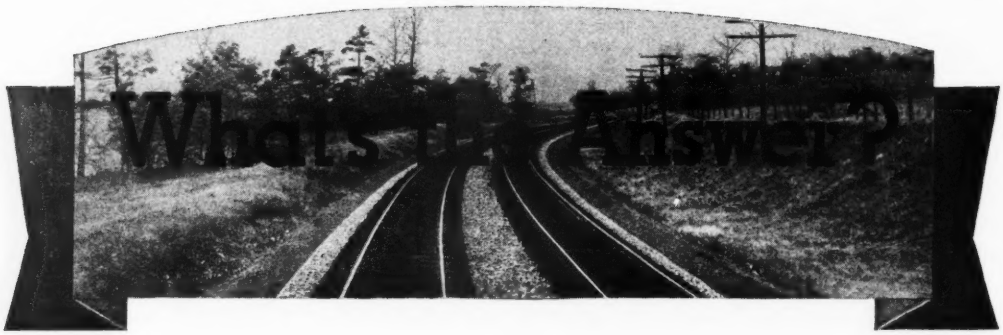
It is provided in the agreement that the companies shall pay the relief forces the same rates of wages as they pay to their regular extra-gang laborers in the particular districts in which work is performed, and shall make the same deductions for board and lodging, if required, and for medical aid, as they make from the wages of their regular extra-gang laborers. The basic day is to be eight hours. If the men are required to work longer, they must be paid overtime. The men are subject to discipline in the same manner as regular employees.

An Appreciation of the Trackman

THAT America is not the only land where railway managements are appreciative of the work of the maintenance of way forces, is evident from the following translation of a tribute to the trackman that appears on a page of the 1936 calendar of the German State Railways, together with the dramatic silhouette photograph of a track gang forking ballast:

What the Railways Mean— The Maintenance Workmen

High speeds, like those of the rapid transit cars and the streamline locomotives of the German State Railways are possible only because of a good track structure. Rails, ties and ballast, the elements of the structure, provide the permanent way over which the high-speed equipment can be operated at 100 miles or more per hour. But such construction requires painstaking and well planned effort. The passenger, who traverses the German landscape, will often see the gangs of maintenance men at their track work. Approximately 60,000 were employed on the German State Railways in 1935, and they insure for you that the railway is kept in a safe operating condition. They go out to their work on motor cars or work trains. They are out in wind and the weather, in rain and snow. Their place of duty is out on the line and their tasks are often hazardous, as they work directly on the main tracks or else immediately adjacent to the tracks on which trains are operated.



How Spirals Should Be Adjusted

If it becomes necessary to increase the elevation on a curve which has been spiraled, should the length of the spiral be increased also? Why? If not, how should the runoff be adjusted?

Must Be Lengthened

By Robert Faries
Assistant Chief Engineer-Maintenance, Pennsylvania, Philadelphia, Pa.

The superelevation for every point on the spiral should bear the same relation to the curvature at that point that the superelevation on the body of the curve bears to the full curvature. Therefore, if the superelevation on the curve is increased, a proportional increase in the superelevation should be made at every station on the spiral.

This cannot be done without increasing the rate at which the superelevation increases by stations on the spiral. This rate of increase should not exceed ¼ in. in 31 ft. for speeds of 90 miles an hour, ⅜ in. for 70 m.p.h. and ½ in. for 50 m.p.h. If the spiral is not long enough to provide such rate of increase, it must be lengthened.

Entire Runoff On Spiral

By R. B. Ball
Assistant Chief Engineer System, Atchison, Topeka & Santa Fe, Chicago

Assuming that the length of the spiral is correct for the present elevation of the curve, based on a predetermined rate of runoff, any increase in this elevation will call for an increase in the length of the spiral. On the other hand, it is not always practicable to increase this length unless the curve is slated for rail renewal, surfacing or other track change. If possible, the entire runoff should be made on the spiral. Where we do not want to change the length of the spiral, we permit additional runoff on the tangent, but not more than one-fourth of the elevation should be run off on the tangent. It is important that curves have proper entering and leaving spirals, and if the elevation is increased to permit higher speeds, the spiral will not ride as good unless the runoff is lengthened the necessary amount.

Runoff Partly on Tangent

By M. M. Backus
Assistant Engineer Maintenance of Way, Illinois Central, Chicago

Twenty-five or more years ago the ordinary practice was to use simple, unspiraled curves with full elevation on the curves, making the runoff at each end of the curve on the tangent, at the rate of ½ in. to a 30-ft. rail. As speeds increased, the foreman made a practice of lining in each end of the curve, starting his runoff at a point two or three rail lengths inside of the curve, so that the elevation at the point of curve and at the point of tangent was 1 to 1½ in. less than the elevation through the body of the curve.

As higher speeds were developed, further action became necessary to insure smooth-riding as the curve was entered, or left, and different forms of spirals were used, with one-half of the spiral on each side of the original point of curve and of the point of tangent. Spirals were selected to permit starting the elevation at the point of spiral and increasing it at the rate of ½ in. per rail length until full elevation was reached at the point of circular curve. In many cases where local conditions did not permit the throwing of the ends of the curve without heavy initial cost, the spiral was shortened and one or two inches

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Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in September

1. What width and length of adze is best suited for adzing ties? Why?

2. What steps should be taken to insure that permanent slow orders over bridges of limited capacity are being observed?

3. When picking up joints and smoothing track, is it good practice to raise the joint higher than the remainder of the rail? Why? If so, how much?

4. How many fire extinguishers should be placed in small stations? Where should they be located? Why? How often should they be inspected?

5. What is the most economical size of crane for laying rail? Should it be full revolving?

6. What means can be employed to overcome the starting inertia of the water in a long discharge line without damage to the pump or the joints in the line? Does the type of pump or the normal pumping head make any difference?

7. What effect does the periodic blowing down of locomotive boilers have on the ties and other parts of the track structure? Why?

8. What does a broken cap in a pile bent indicate? A split cap? What remedy should be applied?

of elevation were run off on the spiral, the remainder being carried out onto the tangent.

With the still higher speeds that are being maintained today it has been found desirable to lengthen the runoff, but it is still desirable to have both the spiral and the runoff the same length, although there are many places where physical conditions make the cost of doing so prohibitive. We have many curves where the last inch or two of the runoff extends beyond the point of spiral.

Runoff all on Spiral

By Henry Becker
Section Foreman, St. Louis-San Francisco, Rush Tower, Mo.

In considering this question one should bear in mind that a certain amount of inertia must be overcome before the car body can adjust itself to the forces which act upon it while passing around a curve. If the curve is unspiraled and the runoff is on straight track, there will be a distinct lurch, the severity of which will depend largely on the speed and rate of curvature, as the car passes the point of curve or of tangent, because this adjustment must be made suddenly. If the curve has a spiral of sufficient length to allow for a low rate of rise, the adjustment will be made gradually and passengers will not be aware of the transition from tangent to curve or curve to tangent.

On the other hand, if the runoff is on a short spiral the rapid lift from level track to curve superelevation, or drop from curve to tangent will be distinctly noticeable and at high speed may be a source of discomfort to passengers. For similar reasons it is not desirable to extend the runoff beyond the spiral onto the tangent.

These considerations indicate the desirability of providing a spiral of sufficient length to complete the runoff on the spiral, at the same time making the rate of runoff low enough to insure an easy transition to and from the curve. For these reasons, where it is necessary to increase the elevation on the curve, the spiral should be lengthened accordingly. The importance of doing so increases as train speeds increase.

Elimination of Slow Orders

What methods can be employed to eliminate slow orders when renewing timber trestles or replacing decks on open-deck steel spans?

Does Not Use Slow Orders

By L. G. Byrd
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

It is our practice to preframe all stringers, ties, caps and guard timbers for pile trestles and all timbers for frame bents. When renewing a timber trestle, we first remove such bolts as will not endanger the safety of the structure, in the number of lineal feet of the bridge which can be changed out during the working hours of the day. We plan our work so that the change can be made a section at a time without the necessity for stopping trains. Obviously, the removal of the old timber and the application of the new members is done under flag protection, but this is done during the intervals between trains and as soon as conditions are satisfactory for the passage of trains at full speed the flagmen are recalled, until we are in position to renew the next section. Likewise ties and guard timbers for steel spans are preframed, and we remove only as much of the bridge deck as can be replaced between trains.

It has been my experience that delays to trains by stopping them or requiring them to reduce speed can be eliminated by careful planning and by making proper preparation in advance of each change from old to new timber. It goes without saying, however, that flag protection should be provided in all cases before any vital part of the structure is removed. We consider that there is greater overall economy in delaying the work of the bridge gang, if this becomes necessary to prevent interference with traffic, than in causing delays to the movement of traffic.

Favors Slow Orders

By J. E. Bernhardt
Bridge Engineer, Chicago & Eastern Illinois, Chicago

I do not consider it advisable to attempt the complete renewal of a timber trestle without applying a slow order. Yet certain methods can be employed which will reduce slow orders to the minimum. The bents can be completed with caps and sway bracing without the necessity for placing a slow order, and this part of the work should be finished first. Timber for the deck, that is, the stringers and ties, should be framed to size.

If slow orders are to be eliminated entirely it will be necessary to remove only such timber as can be replaced with new timber and full bolted between trains. This is not practicable, and I prefer to restrict the speed of trains during working hours. By full bolting each 8-hr. day's work, however, slow orders can be eliminated during the remainder of the 24 hours. To do this, however, it must be possible to make the renewal without inserting runoffs in the grade line of the rail. Where it is necessary to make a runoff I do not consider that it is practicable to eliminate slow orders during any part of the day. The use of power tools for boring holes will be of particular assistance in reducing the periods during which slow orders must be in effect, since their use makes it easier to leave the work full-bolted every night.

It should not be necessary to place slow orders when renewing the deck on an open-deck steel span, provided all ties have been framed carefully to the proper depth before they are put in, and there is no change in the distance from the base of rail to the top of the steel supporting the ties. Where there is some difference in this distance, runoffs become necessary and so do slow orders. In carrying out the work on either type of deck, any devices that are to be used for holding the ties to the proper spacing should be in place before trains are allowed to pass at full speed.

Slow Orders Not Necessary

By Joseph Hazelwood
Bridge Foreman, New York, Chicago & St. Louis, Frankfort, Ind.

During my 22 years bridge experience, 14 of which have been as foreman, it has not been necessary to place a slow order when renewing a timber trestle or the deck of an open-deck steel span. To avoid slow orders, however, one must know exactly when trains may be expected, and this is done by means of a telephone connection with the dispatcher. If only the ties are to be renewed, we remove both the inner and outer guard rails and pull the spikes in every second tie. If we have 30 minutes we start at the end of the bridge and replace 10 to 15 ties out of face, spiking every third or fourth tie. If

the interval is longer more ties can be replaced. The guard rails are always replaced before quitting for the day. One should watch the expansion carefully, especially during hot weather. If the rail is tight it may be necessary to renew ties only during the morning hours before the rail becomes heated.

When renewing stringers we remove only as many as can be replaced between trains. If frame bents are 15 ft. or less in height we throw out the old bent and erect the new one between trains. If they are more than 15 ft. high we erect the new bent beside the old one, and jack the old bent out and the new one in at the same time. If the bents are of piling we construct the new ones, leaving the old ones in place until the renewal of the structure is completed, after which they are dismantled.

All of this work is done under flag protection, but we rarely find it necessary to stop a train since we keep closely in touch with the dispatcher and plan our work so that, barring some unexpected difficulty, we are able to call in the flags before the train is due to arrive. On the Clover Leaf district to which I am assigned we have a large number of wood trestles, some with more than 100 bents. In not a few cases we have bents that require posts 58 ft. long. Even when renewing these structures we have found that the work can be done without issuing slow orders or stopping trains.

First Aid in Heat Prostration

How should one proceed to give first aid in cases of heat prostration?

Differs from Sunstroke

By D. B. Moss, M. D.
Chief Medical Officer, Chicago, Burlington & Quincy, Chicago

For practical purposes, sunstroke and heat prostration may be considered as grades of the same condition. Either occurs after prolonged exposure to high temperature, usually combined with excessive atmospheric humidity. The signs which arise are directly opposite, for which reason it is important to recognize them before instituting treatment.

Heat prostration may develop suddenly, or it may come on gradually with a long train of symptoms. The temperature is only slightly elevated or it may even be subnormal. The pulse is rapid and weak. There is a cold, clammy perspiration and the patient is pale. Usually there is complaint of dizziness, faintness and nausea. Muscular prostration is pronounced. Rarely is there loss of consciousness. Prognosis is favorable in the case of heat prostration; that is, death seldom results.

Treatment. The patient should be removed to a quiet, comfortable, well-ventilated place. Stimulants, such as hot coffee or tea, should be administered. If the patient appears prostrated or complains of being cold, hot baths or hot applications should be resorted to. Heart stimulants may be required, but they should be given only by direction of a physician.

Sunstroke presents an opposite picture. It is more serious but, fortunately, less frequent. There may be warning symptoms, such as dizziness, throbbing headache, cessation of sweating and nausea with vomiting. Or the attack may develop suddenly and the patient fall unconscious, dying in this state without regaining consciousness. Frequently, it is difficult to decide whether the patient has a sunstroke, an apoplexy or a uremic coma. More often the coma of sunstroke is not as profound as the coma of apoplexy or uremia. Headache may be intense. The face is flushed. The pulse is full and rapid. The breathing is labored and stentorous (resembling snoring). The pupils are contracted. The skin is hot and dry. The temperature usually ranges from 104 to 107 deg., but in profound cases may be subnormal, or a hyperpyrexia, that is temperatures as high as 110 to 115 deg., may be found.

Treatment in sunstroke is urgent. The patient should be removed to the shade, into as cool a place as is available, the clothing removed and the body placed in an ice bath if available, or failing this, it should be massaged with ice packs, turning the body meantime so that the entire surface may be covered. An ice pack should be kept constantly applied to the head. If ice cannot be obtained, the body should be doused with the coldest water obtainable. A physician should be summoned immediately.

Heat cramps is a trouble encountered frequently among those exposed to high temperatures and doing heavy muscular work, causing excessive sweating. The symptoms are muscular twitching and muscular cramps, particularly in the forearms and legs. The duration is usually less than 24 hours. Heat cramps may be avoided by dissolving a teaspoonful of common salt in each gallon of water used for drinking purposes.

Symptoms Are Different

By W. J. Bergen, Jr.
Chief Clerk, New York, Chicago & St. Louis, Cleveland, Ohio

Heat prostration may be either sunstroke or heat exhaustion but, as they differ widely, to attempt first aid without a knowledge of these differences as well as the symptoms and treatment, would be harmful or even dangerous. Sunstroke is caused by direct exposure to the sun's rays, frequently because of insufficient protection for the head and neck. The symptoms are headache, dizziness, hot dry skin, high temperature and strong pulse. Lay the patient in the shade with the head and shoulders elevated and the clothing loosened. Cool the head and body by applications of cold water or cold cloths. If water from a questionable source must be used in the emergency, the patient's eyes, nose, mouth and any cuts or sores should, so far as possible, be protected against infection. A physician should be called immediately, and stimulants should not be administered. The seriousness of sunstroke is shown by the fact that one-fourth of the hospitalized cases die.

The symptoms of heat exhaustion are dizziness, faintness, paleness, a moist cool skin, with profuse perspiration and weak pulse. Treatment consists of laying the stricken person on his back with his head level. He should be covered with coats or anything available to raise the body temperature. Hot tea or coffee should be given, but if not available, hot water is better than nothing. A physician need not be called if the patient responds readily to treatment, but he should not be allowed to return to work until the following day.

Quick Action Needed

By Duncan Eve, Jr.
Chief Surgeon, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

Briefly, first aid procedure in cases of heat prostration or exhaustion is as follows: (1) Plenty of fresh air away from heat; (2) stimulants should be given—aromatic spirits of ammonia; (3) temperature, if pres-

ent, should be reduced by means of wet or ice packs, or even a cold bath; (4) give water freely and if the patient is "dried out," that is, suffers from cramps, give sodium chloride (common salt), one dram in a glass of water; (5) call a physician at once.

There Are Two Types

By Paula Fulnecky
Life-guard Examiner, Purdue University, Lafayette, Ind.

Heat prostration is of two types, heat exhaustion and sunstroke. In heat exhaustion the victim is conscious but weak. He will be very pale and covered with cold clammy sweat, and both his breathing and pulse will be weak and irregular. Severe cases may be almost as dangerous as sunstroke. A person suffering from heat exhaustion should be carried immediately to a cool shady spot, his clothing loosened or removed if possible, and cold water or stimulants given as often as the patient will take them.

In a case of sunstroke the victim is unconscious, with a slow heavy pulse and the pupils of his eyes will be very large. One person should take charge and with the help of another remove the victim to a cool spot and loosen his clothing, keeping others away so that the patient will have plenty of air. Ice or, in its absence, cold damp cloths should be placed on the patient's chest, wrists and under his armpits. Never attempt to force liquids down his throat while he is unconscious. As soon as consciousness returns he may be given cold drinks as frequently as he will take them. If the victim is treated immediately and effectively, there should be no after effects from a sunstroke.

Should a Tie Be Left Out?

When renewing ties, is it good practice to allow a train to pass over the track before a tie is replaced? If not, why?

Little Objection

By Thomas McMannis
Track Supervisor, Central of New Jersey, Somerville, N. J.

When renewing ties it is good practice to replace the ties and fork tamp them well up against the rail without applying the tie plates, before a train passes over the track. It is desirable to have a train pass over the track before the tie plates are installed to compact the loose ballast under the tie. The application of the tie plates after the initial tamping will decidedly lessen the looseness of the newly installed ties.

Ordinarily, where ties are installed singly and are not spotted too close together, no special effort is needed to replace every tie removed, before a train passes over the track. To endeavor to time the tie-renewal work to attain this end in every case would, in many instances, restrict the day's performance to some extent. Obviously, where two or more ties are to be renewed in one spot, or where there are abnormally wide cribs on either side of a single tie, the new ties should be placed before a train passes.

The actual work of renewing ties is carried out in many ways to suit varying conditions, but in every case, good practice dictates that very few ties should be removed and not replaced at any given time. With only a few ties missing, under ordinary circumstances there would be no danger in allowing a train to pass over the track and no objectionable effect will be felt on the train.

Cannot Delay Trains

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

As a regular practice, trains should not be permitted to pass over track from which a tie has been removed and not replaced. If it can be done for one tie, why not more? This is a case where a little laxity might lead to serious consequences. On a line where all trains are scheduled or when the approach of trains can be observed for a considerable distance, there should be no excuse for having a gap in the ties when trains pass.

On the other hand, there are lines where many unscheduled trains are operated and where the view is limited. In such cases, a foreman will sometimes be caught with a tie out and no opportunity to replace it before the train passes. This has happened many times and probably will again. If the rail is a heavy section and the ties are spaced uniformly, no particular harm should result. I do not consider it safe, however, to allow trains to pass over track from which two adjacent ties are missing. If the rail is light, the danger of surface bending or even breakage when a single tie is out may be great. In any event, as a practice, it should be discouraged.

No, But Safe

By Robert White
Extra Foreman, Grand Trunk Western, Pontiac, Mich.

Although it is not good practice to allow trains to pass over track where a tie has not been replaced, the absence of a single tie does not make the track unsafe or cause damage to it. Furthermore, from the standpoint of economy it is better not to replace the tie than to have the gang lose time waiting for a train to show up before they remove the old tie. I do not want to be misunderstood as placing economy above safety. What I mean is that sound judgment is needed in the consideration of both.

After six years of deferred tie renewals, there must be some ties which might as well be removed and the cribs filled in, for all the support they are giving the rail. Where a tie is not performing its function, the situation is no different from that in which a tie has been removed and not replaced. It is true that where a tie is missing there is always the possibility that the rail may bend or break during the passage of a train; yet in many years of track work I have never seen this happen. While I do not believe that any material damage is likely to occur with one tie out, I do not approve the extension to two adjacent ties, because the unsupported span would be too great. While modern locomotives have increased in weight, so that the rail carries a greater load than formerly, rail sections are also heavier and can withstand the effects of the heavier loads that they are required to carry.

Not if Rail Is Tight

By J. Morgan
Supervisor, Central of Georgia, Leeds, Ala.

This will depend on the size of the rail, the condition of the remaining ties, the condition of the roadbed, whether on curve or tangent and, if on a curve, on the degree of curvature. I consider it safe to allow trains to pass on tangent when one tie is out, and on curves up to 10 deg., provided the remaining ties are sound and the gage is good. However, it is better to have all ties in place before trains pass at full speed, and to do so seldom hin-

ders the progress of the tie renewals.

In hot weather, if the rail is tight, it is the part of wisdom to keep all ties in and full spiked to reduce the probability that the track will buckle, even under trains. If there is no likelihood of the track buckling, and the rail is a heavy section, it is perfectly safe to allow trains to pass over track with one tie out, provided the remaining ties are sound, the roadbed solid and the curvature not sharper than 10 deg.

What Is Mildew on Paint?

What is mildew on paint? How can it be prevented? What can be done to correct it?

A Fungus Growth

By George A. Belden
Architect, Central of Georgia, Savannah, Ga.

Mildew is a dark fungus frequently noticed on painted wood surfaces, which tends to develop under a combination of moisture, warmth and shade. It is usually found on surfaces which are covered with paint of a soft, chalky nature which apparently offer easy lodgment for wind-blown matter from decayed and dried vegetation. Sometimes the oil with which the paint is mixed is infected and offers a breeding place for mildew.

Mildew on painted surfaces can best be prevented by avoiding the use of linseed-oil substitutes made from semi-drying and non-drying oils and by using paint that will dry with a hard smooth surface. The addition of a small percentage of mercurous chloride to the paint will sometimes retard the growth of mildew. In repainting a surface which shows signs of mildew, it is advisable to remove the old paint completely by burning.

Use Mercury Bichloride

By A. T. Hawk
Engineer of Buildings, Chicago, Rock Island & Pacific, Chicago

Mildew is a low order of plant growth on many kinds of surfaces, occurring mostly in the South where the atmosphere is warm and humid. It is detrimental to painted surfaces, giving a brownish powdered effect to the paint film. It also occurs in any shady spot, damp corner or elsewhere where the humidity is high.

Mildew can be combatted successfully by proper preparation of the surface before it is repainted. This consists of a thorough scrubbing with soap and water and rinsing with clear water. After the surface has dried it should be brushed with a solution made by dissolving two bichloride of mercury tablets in a gallon of water, after which it is again allowed to dry. This treatment usually kills the mildew which already has gained a foothold on the surface.

To prevent mildew from attaching itself to a new coat of paint, or one applied over a previously treated surface, two tablets of bichloride of mercury should be dissolved in as small a quantity of water as they can be dissolved in. Add to this solution about an equal quantity of alcohol, and stir this mixture into one gallon of the paint that is to be applied. It will mix readily with the paint, but should be well stirred in order to diffuse it evenly throughout the paint. Mercury bichloride, or corrosive sublimate as it is commonly called, is a deadly poison and any one using this formula should be warned of this fact.

Where the area to be painted is small and the wood is not likely to be thoroughly dry, especially if it is located in a very shaded or moist place near the ground, it may be desirable to renew the boards with treated lumber which will resist moisture and decay. Several types of lumber treated for this purpose are available commercially at a reasonable cost, which will take paint with the same facility as untreated wood, which offer little prospect of mildew trouble.

Where to Apply Anti-Creepers

Should anti-creepers be applied opposite joints? Why?

Yes, if Slot Spiked

By C. G. Fulnecky
Assistant District Engineer, New York Chicago & St. Louis, Frankfort, Ind.

This will depend on whether the joints are slot spiked. If so, they will act in a measure as anti-creepers and tend to drag the ties out of square. For this reason, if both rails run in the same direction, anti-creepers should be applied opposite the joint against the ties which are slot spiked. If the rails creep in opposite directions, or only one rail moves, the anti-creepers should not be placed opposite the joints, but should be located at least one or two ties away from the joint. The reason for this is to prevent excessive sluing of the joint ties, which is detrimental not only to the ties but to the track as a whole.

Prevent Ties Slueing

By Roadmaster

Where rails are laid with slotted angle bars and the joint ties are spaced, anti-creepers should be applied opposite the joints. If there is any movement of the rail in creepage and anti-creepers are not applied opposite the joints, the ties will slue, with the result that the gage will tighten and the track will become kinky.

Where rails are laid with unslotted joints, and regardless of whether the joint ties are spaced, it is advisable to apply the anti-creepers on ties other than those under the joints, since the shifting of the joint ties off their bed if the rail moves, will result in low joints, damage to the rail ends and rough-riding track.

Symmetrical Joints Best

By L. A. Rape
Extra Foreman, Baltimore & Ohio, Wampum, Pa.

Anti-creepers should never be placed opposite joints unless they are slot spiked. In this case it is necessary to do so in order to keep the ties straight. Leaving a slot-spiked joint without anti-creepers opposite to it will create the same condition with respect to the joint ties that would exist in the intermediate ties if only one anti-creeper were applied against each tie. In other words, the ties would be sure to slue.

I believe that joints that have no provision for slot spiking are superior to those that do, since they present no hazard in pulling throat-cut spikes. Slot spiking is the oldest device for prevention of rail creepage, but it has proved to be ineffective and there is no good reason why it should persist. The symmetrical or toeless joint is the best type since it gives excellent support to the rail, does not require a special tie

plate and cannot be slot spiked. Where these joints are used, anti-creepers should not be applied opposite them.

Use with Judgment

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

The anti-creeper is one of our most valuable track accessories, but like other devices it must be used with judgment. If placed opposite a free joint, that is, one that is not slot spiked, and the rail creeps, the end of the tie opposite the joint will be pushed off of its bed and the tie will be out of square. If the joints are slot spiked and anti-creepers are not placed opposite them, the same thing may happen to the joint end of the tie. For these reasons, slot spiked joints should have anti-creepers applied opposite to them, and those that are not slot spiked should not. In the latter case, the application should be made two ties away from the joint. On single track, where the two rails tend to creep in opposite directions, anti-creepers should be applied on the opposite sides of the ties.

Should Be Opposite

By Chief Engineer

Anti-creepers should always be placed against the same tie for both rails, to prevent the tie from sluing. If the joints are slotted and the spikes driven in the slots, then the rail opposite the joint should have anti-creepers applied on the ties that are slot spiked. If the joint is not slot spiked, then anti-creepers should be applied on both rails against the same tie at points other than at the joints.

Cleaning a Drainage Line

How does one go about cleaning a clogged sewer or sludge line?

Several Methods Available

By J. P. Hanley
Water Service Inspector, Illinois Central, Chicago

Sewers may be cleaned by hand tools, by flushing with water or by machine tools consisting of various types of rotary cutting or boring machines which are on the market. The routine method most used is the hand method, which consists of first cleaning the sewer basins thoroughly and then "rodding" the sewer from the downstream basins in consecutive order and flushing with water if available. At one terminal in Chicago the water-service men have provided themselves with a small orange-peel bucket having a capacity of about 2 cu. ft. This bucket is operated from a tripod derrick placed over the catch basin or manhole, with a lifting and operating cable attached to the bucket. Two men can clean the basins readily without the former drudgery of descending into the basins and hoisting the deposits out in pails. This practice makes it easy to clean catch basins.

Sewer rods are made of rolled steel strips and sectional wood rods with steel extension connections, which are introduced into the sewer stoppage from the nearest downstream basin and obstructions are thus dislodged between basins.

The rotary tools now on the market are operated by water pressure, by hand and by electric current. The latter are often mounted on a cart and are mostly used by city sewer departments to remove heavy deposits, root growth and other obstructions. Their use depends on readily available electric connections. A systematic schedule for cleaning sewer basins will overcome most of the trouble with sewer stoppage which must otherwise be contended with.

Depends on Conditions

By R. C. Bardwell
Superintendent Water Supply, Chesapeake & Ohio, Richmond, Va.

The method to be employed will depend in large measure on the local conditions, together with the type and character of the obstruction. It is assumed that the sewer or sludge line under consideration is of the larger size and that the deposits are such that they cannot be removed readily with strong lye or other cleaning chemicals.

If the deposits are soft and do not adhere tightly to the sides of the sewer, and water under pressure is available, the simplest method of cleaning is a thorough flushing with water under pressure. To obtain this pressure in the sewer, a collapsible bag, which is regular sewer-cleaning equipment, and is obtainable in sizes from 4 in. to 20 in. for standard 2-in. or 2½-in. fire hose connections, is inserted in the sewer just behind the hose nozzle. When the water pressure is turned on, the bag fills and seals the drain, which allows the water pressure to work on the clogged part of the sewer.

If the deposits are still soft, but not removable by straight flushing, equipment known as a self-propelling ferret turbine can be attached to a standard fire hose and inserted at the lower end of the sewer to work upstream. This type of equipment works best in sewers from 6 in. to 12 in. in diameter and requires a minimum water pressure of 50 lb. at the machine for propelling and washing out the material cut loose by the whirling blades.

For harder and denser obstructions, it is necessary to use cleaning equipment which can be pulled through the sewer with a cable and windlass. When using this equipment, standard sewer rods, which are obtainable in 3-ft. lengths with flexible couplings, are pushed through the sewer from one manhole to the next. A small cable is then drawn through, which permits a larger cable of sufficient size, usually ⅜ in., to handle the cleaning machine, to be pulled back. The cleaning machine with scrapers and cutters, to which is attached a hose line from which water is obtained for washing out the sediment as it is cut loose, is then attached to the larger cable and pulled through the sewer with a windlass.

In some sludge lines from lime-soda ash water-softening plants which have a non-uniform operation, the stoppage may be due to incrustation and scale on the pipe. The usual sewer-cleaning equipment may not be sturdy enough to remove hard deposits of this character, and it is sometimes necessary to use standard water-main cleaning equipment which is designed for the removal of hard deposits of this type.

Can Use Several Tools

By C. G. Fulnecky
Assistant District Engineer, New York, Chicago & St. Louis, Frankfort, Ind.

An effective way to clean out the great majority of obstructions to sewers and sludge lines is, after locating the point of stoppage, to use the ordinary sewer rods to dislodge the obstruction. In some cases where the deposit in a sludge line does not respond to this treatment it may be necessary to dig it up, clean each section and replace it.

A variety of tools are now available

for cleaning sewer, sludge and water lines at relatively low expense. These are usually operated by water under pressure and perform the cleaning operation by means of rotating blades which bore or cut through the deposited material.

Machines of this type should be started at the outlet of the drain or the manhole next below the obstruction and worked toward the upper end of the pipe to allow the excavated material to be washed down and out of the drain. Where the diameter of the pipe changes, it will be necessary to change the size of the equipment. These machines are operated as turbines and as they cut their way through the obstruction the material that is loosened will be washed out by the water that is used to drive them.

Turbine machines are also very effective in cleaning out sludge lines and water lines that have deposits from the chemicals employed in water softening. In this case, however, it is usually necessary to have machines that are capable of cutting through encrustations and scale, for which reason they must be stronger and more rugged than those ordinarily required for the removal of other types of obstruction in sewers.

First Locate Choke

By John Cole
Water Service Foreman, Canadian National, Toronto, Ont.

First try to locate as nearly as practicable the point at which the sewer is choked. If it is a tile pipe, cut a small hole in the top of the drain just large enough to insert a wire with a small hook to remove the obstruction. If the stoppage is more serious and cannot be removed in this way, enlarge the opening enough to allow a cable with a corkscrew on the end to pass through. The corkscrew will wind itself around the material and it may be pulled back to the opening.

If tree roots have entered the sewer, the only remedy is to remove that part of the drain in which they have accumulated and replace the pipe, using special care to insure that the joints are absolutely tight. If an opening, no matter how small, is left, the roots will again enter and the trouble will be repeated. When the sewer has been cleaned, it should be flushed out with water if at all possible.

I do not recommend the use of lye or other chemicals, since it has been my experience that most of them tend to crystallize and deposit on the walls of the sewer, reducing the area of the drain.

If iron pipe is used for the sewer, cleanouts should be placed at all points of change of direction and in convenient places to clear any stoppage without making it necessary to break into the drain. When laying tile drains or sludge lines, it is advisable to place catch basins or manholes at all points where the drain changes direction. In this event, most of the stoppages which occur can be cleared by using drain rods. The catch basins should be about 3-ft. square to provide ample room for allowing the men to operate the drain rods properly.

Protection Against Termites

What means can be employed to protect against termites? Are they fully effective?

Protection Is Simple

By Master Carpenter

Protection against the entrance of termites into a building is simple and adds little to the cost of the structure. If the premises are clean and there are no tree stumps, old sheds or other dead wood in the vicinity, the chance of infestation is greatly reduced. Yet termites will sometimes get a foothold in a most unexpected way.

In the first place, the foundation should be absolutely tight, without cracks or crevices that might provide a means of entrance. No wood should be closer than 18 in. to the ground, and all wood below the floor level should be creosoted. It should also be framed before treatment, so that no untreated wood will be exposed through cutting and boring during construction. Wood steps leading to porches should rest on concrete footings or slabs. Basement windows should be well above the ground to protect the frames from attack.

For frame buildings, a shield of non-corroding metal inserted between the foundation and the sills affords an effective protection against the entrance of termites. It should be of sufficient width to allow it to extend about 2 in. from the faces of the foundation when it is turned down at an angle of about 45 deg. In a brick or concrete building a similar shield can be inserted in the wall about 18 in. above the ground. Similar shields should be placed around pipes and columns supporting floors.

Termites sometimes enter a building through the construction joints of basement floor slabs, particularly along foundation walls and around column pedestals. To prevent this, these joints should be sealed with hot coal tar; asphalt for this purpose is completely useless.

Entrance Often by Chance

By Engineer of Buildings

The normal habitat of termites is in dead wood, stumps, etc., on which they feed. In the spring, and sometimes in the fall, males and females swarm for the establishment of new colonies. Usually the invasion of buildings has its source through foraging tunnels made by the workers under the surface of the ground; thence, by chance, contacts are made with buildings of wood or with the structural wood of masonry buildings. Entrance through basement timbers is immediate, although the invasion may not be recognized for several years. Termites often bridge over masonry foundations by means of earthlike shelter tubes built of earth and wood particles. A common means of entry is by means of cracks in masonry foundation walls.

For these reasons, masonry footings and foundations should be either of concrete or laid in portland cement mortar. Foundations of brick, stone, concrete blocks or tile should be capped below the woodwork with at least 1 in. of portland cement mortar or with a non-corroding metal. Frame buildings should be provided with metal termite shields completely around the masonry foundation, including all pillars, supports and piping, below the woodwork. This shield is inserted between the foundation and the wood, with edges projecting at least 2 in. from the faces of the foundation, and bent down at an angle of 45 deg.

All timber in contact with the ground should be thoroughly impregnated with creosote, and framed before treatment.

Railroad Employment Shows Increase in May

As of the middle of May the Class I railroads, excluding switching and terminal companies, had 1,067,964 employees on their payrolls, as compared with 997,078 in the corresponding month of 1935, an increase of 70,886 employees, or 7.1 per cent, according to reports compiled by the Interstate Commerce Commission. As compared with April, the number of employees in May showed an increase of 18,421, or 1.8 per cent.

Harriman Safety Medals Awarded

The Union Pacific, the Duluth, Missabe & Northern and the Pittsburg, Shawmut & Northern have been awarded the E. H. Harriman memorial medals for their 1935 safety records. The presentations were made on June 10 at the Hotel Commodore, New York, at a luncheon given by Arthur Williams, president of the American Museum of Safety. The Union Pacific won the gold medal for railroads in Group A, which comprises Class I roads operating 10 million or more locomotive miles per year; the Duluth, Missabe & Northern was the winner of the silver medal in Group B, comprising Class I roads operating between one million and 10 million locomotive miles; and the Pittsburg, Shawmut & Northern received the bronze medal awarded to the winner in Group C, comprising Class I railroads operating less than one million locomotive miles a year.

Rail Net Shows Increase in April

For April the Class I railroads of the United States had a net railway operating income of $41,547,644, which was at the annual rate of return of 2.44 per cent on their property investment, as compared with a net of $34,708,718, or 2.03 per cent, in April, 1935, according to reports filed with the Bureau of Railway Economics of the Association of American Railroads. Operating revenues for April amounted to $313,409,628, as compared with $274,663,066 in April, 1935, an increase of 14.1 per cent, while operating expense amounted to $235,072,729 as against $209,415,791, an increase of 12.3 per cent.

For the first four months of this year these roads had a net railway operating income of $146,112,621, or 2.18 per cent, as against $121,075,241, or 1.81 per cent, in the corresponding period of 1935. Operating revenues for the four months totaled $1,221,270,856, as compared with $1,074,680,303, an increase of 13.6 per cent. Operating expenses amounted to $939,336,262 compared with $834,135,279, an increase of 12.6 per cent.

Co-ordinator's Office Expires

The position of federal co-ordinator of transportation, which had been held by Joseph B. Eastman under the provisions of the emergency railroad transportation act of 1933, expired by limitation at midnight on Tuesday, June 16, and Mr. Eastman resumed his duties as a member of the Interstate Commerce Commission, a position which he continued to hold while serving as co-ordinator. The emergency act was passed three years ago with provisions for its extension for a second year by the president. It was so extended for a second year by his order and when the law expired by limitation last year it was renewed for still another year. While efforts had been made by the Senate Committee on Interstate Commerce to obtain further extension of the act they were unsuccessful.

As indicated by the title, the purpose of Mr. Eastman's office was to bring about the co-ordination of railroad facilities and services for the purpose of effecting economies. However, he was unable to accomplish much of a tangible nature in this direction because of a provision in the emergency act prohibiting railroad consolidations, at the instance of the co-ordinator, that would increase unemployment among railroad employees. During his tenure of office Mr. Eastman, assisted by a staff of about 135 persons, made extensive studies concerning many phases of railroad activity and compiled his findings into voluminous reports, accompanied in each case by recommendations, of which few were considered acceptable by the railroads.

Equipment Orders Exceed Last Year's Totals

More railroad rolling stock was ordered during the first five months of 1936 than during the entire 12 months of 1935, according to reports published in the *Railway Age*. During the first five months of the current year a total of 22,240 freight cars were ordered for domestic service, as compared with 18,699 during the entire 12 months of 1935. Furthermore, inquiries for 4,575 freight cars were outstanding on June 1, which, when converted into orders, will bring the total number of freight cars ordered so far this year above that for the entire 12 months of any year since 1930. Other equipment ordered during the first five months of this year, together with the corresponding figures for the entire year of 1935, includes 98 locomotives as compared with 83; 87 passenger train cars as against 63; and 5 streamlined trains as compared with 3 such trains in 1935.

Rails Inaugurate Advertising Campaign

A national joint advertising campaign involving the expenditure of approximately $1,500,000 was inaugurated by the Association of American Railroads in June. The purpose of this campaign is to increase railroad freight and passenger traffic and to educate the people concerning the needs of the railroads, with a view to securing relief from the rising tide of regulatory legislation and preventing the passage of legislation that will result in prohibitive labor costs to the end that the railroads will be allowed to compete for business on an equal basis with other carriers and to operate under conditions that will permit the realization of a reasonable return on the capital invested.

More Streamliners for Union Pacific

During June three streamlined trains were placed in service by the Union Pacific, bringing the total number of such trains operated by this company to six. The latest streamliners to be placed in service by this company are the Streamliner—City of San Francisco, consisting of nine articulated body units and a two-unit locomotive, which went into service between Chicago and San Francisco on a schedule of 39¾ hr. on June 14, and the two Streamliners—City of Denver, each consisting of two power cars and ten revenue cars articulated in two-car units, which went into service between Chicago and Denver on June 18 on a schedule of 16 hr., or an average of 65.5 miles an hour.

I. C. C. Continues Freight Surcharges

In a report and order made public on June 12 the Interstate Commerce Commission authorized the railroads to continue in effect for an additional six months after June 30, the original expirational date, the emergency freight surcharges, with some modifications and exceptions, which it authorized in 1935. At the same time it denied the petition of the railroads that they be allowed to keep the surcharges in effect indefinitely. These charges had been in effect since April 18, 1935, and the railroads had estimated that for a full year they would yield increased revenue amounting to more than $100,000,000. While allowing the temporary continuance the commission stated that "it should be definitely understood that we adhere to the view that general rate increases, particularly for indefinite duration, are an inadequate and dangerous method of meeting the current problems of the railroads," and that the extension is permitted "only because other and more permanent avenues of improvement in the railroad situation, principally for causes beyond applicants' control, have not had time as yet to operate effectually."

Personal Mention

General

H. H. Clark, assistant division engineer on the Eastern district of the Erie, with headquarters at Buffalo, N. Y., has been promoted to inspector of transportation, with headquarters at Cleveland, Ohio.

H. D. Barnes, cost engineer in the office, of the auditor of capital expenditures of the Chicago & North Western, at Chicago, has been appointed auditor of capital expenditures.

Clifford S. Leet, land agent for the Bessemer & Lake Erie, and formerly an assistant engineer on this road, has been appointed assistant general manager, with headquarters at Pittsburgh, Pa.

Duncan J. Kerr, assistant to the president of the Great Northern, and an engineer by training and experience, has been appointed assistant to the president of the Lehigh Valley, with headquarters at New York.

F. L. C. Bond, general superintendent of the Montreal district of the Canadian National, and formerly chief engineer of the Central region of this road, has been appointed general manager of the Central region, with headquarters at Toronto, Ont. Mr. Bond was born at Montreal, Que., and was graduated from McGill University, Montreal, in 1898, with a Bachelor of

F. L. C. Bond

Science degree. He entered the service of the Grand Trunk (now part of the C.N.R.) in 1898 as assistant to the resident engineer of the Eastern division. In 1901 he was appointed engineer in charge of double track construction and from January to March, 1902, he was night superintendent on construction of the Park Avenue tunnel of the New York subway system, returning to the Grand Trunk in April of that year. He was then appointed resident engineer on the Eastern division, in which position he remained until 1913, when he became division engineer on the Eastern lines. After service in the World War, Mr. Bond returned to the Grand Trunk as chief engineer, and following amalgamation of the lines comprising the Canadian National he was appointed chief engineer of the Central region, with headquarters at Toronto, Ont. He held this position until April, 1924, when he was appointed general superintendent of the Montreal district.

Daniel M. Driscoll, superintendent on the Northern Pacific at Missoula, Mont., and formerly a roadmaster on this road, has been appointed assistant to the operating vice-president, with headquarters at St. Paul, Minn.

Robert M. White, superintendent of the Morris and Essex division of the Delaware, Lackawanna & Western, and formerly a division engineer on this road, has been appointed assistant to the general superintendent, with headquarters as before at Hoboken, N. J.

William B. Irwin, an engineer by training and experience, has been appointed assistant to the operating vice-president of the Great Northern, with headquarters at

William B. Irwin

St. Paul, Minn. Mr. Irwin was born on December 20, 1887, and studied civil engineering at Ohio Northern university. He entered the employ of the Great Northern on March 26, 1907, as a draftsman. From September 13, 1907, to April 18, 1909, he engaged in other work, returning to the Great Northern at the end of this period as a draftsman in the office of the chief engineer at St. Paul. In the following year he was transferred to Minot, S. D., where he was appointed assistant engineer on April 1, 1913. On October 19, 1913, Mr. Irwin was advanced to assistant engineer for the Eastern district, and on January 1, 1914, he was made assistant chief draftsman in the chief engineer's office, being named office engineer for the Eastern district on June 1, 1916. Six years later he was appointed chief clerk to the general manager of the Eastern lines at St. Paul, and on July 15, 1929, he was appointed staff assistant in the office of the operating vice-president at the same point, retaining the latter position until his recent appointment as assistant to the operating vice-president, effective June 1.

William W. Judson, assistant to the general manager of the Northern Pacific at Seattle, Wash., who was formerly connected with the engineering and maintenance of way departments of this road, has been appointed superintendent of the Yellowstone division, with headquarters at Glendive, Mont. Mr. Judson was born on March 24, 1891, at Rochelle, Ill., and received his higher education at Knox college, Galesburg, Ill., and Dartmouth college, Hanover, N. H. He first entered railway service in 1911, in the engineering

William W. Judson

department of the Spokane, Portland & Seattle, leaving this company in 1914 to go with the Northern Pacific, where he served as a rodman, instrumentman and assistant engineer in the engineering department at Centralia, Wash., until 1917. In that year Mr. Judson joined the United States Army, becoming a first lieutenant in the transportation corps and serving in France for 15 months. In 1919 he returned to the service of the Northern Pacific, serving as an assistant engineer on maintenance and construction work until 1927, when he was assigned to the position of special assistant to the operating vice-president at St. Paul, Minn. Two years later he was made trainmaster on the Pasco division at Pasco, Wash., later being transferred successively to the Idaho division at Spokane, Wash., and to the Tacoma division at Seattle, Wash. In 1933 he was advanced to assistant to the general manager, with headquarters at Seattle, which position he was holding at the time of his recent appointment, effective June 1, as superintendent of the Yellowstone division.

E. A. Whitman, chief engineer of the Minneapolis, St. Paul & Sault St. Marie and the Duluth, South Shore & Atlantic, with headquarters at Minneapolis, Minn., has been appointed acting general manager of the Soo Line and has been elected vice-president of the D. S. S. & A., with the same headquarters.

M. I. Dunn, Jr., division engineer of the Huntington division of the Chesapeake & Ohio, with headquarters at Huntington, W. Va., has been promoted to trainmaster on the Handley-Coal subdivisions of the road, with headquarters at Handley, W. Va. Mr. Dunn was born on October 29, 1899, at Scottsville, Va., and was graduated from Washington & Lee University in 1923. He entered railway service with the Chesapeake & Ohio on July 15, 1916,

as a rodman and later as an instrumentman, and then, from 1919 to 1923, during his summer vacations from college, he again worked for the same road. On June 15, 1923, immediately after graduation, he became an instrumentman in the construction department of the C. and O., with headquarters at Huntington, W. Va., and on October 1 of that year, he was promoted to assistant engineer in the maintenance of

M. I. Dunn, Jr.

way department, with headquarters at Clifton Forge, Va. One year later, Mr. Dunn was promoted to assistant division engineer, with headquarters at Richmond, Va., and on August 15, 1925, he was transferred to Huntington, W. Va. On April 15, 1929, he was promoted to division engineer at that point, which position he was holding at the time of his recent promotion to trainmaster.

Engineering

D. A. Logan, track supervisor on the Erie, with headquarters at Kent, Ohio, has been promoted to assistant division engineer, with headquarters at Youngstown, Ohio, to succeed **S. B. Ginn,** who has been transferred.

A. L. Becker, architect for the Gulf Coast Lines and the International-Great Northern, with headquarters at Houston, Tex., has been appointed architect for the Missouri Pacific Lines, of which the former roads are constituents, with headquarters at St. Louis, Mo.

F. G. Smith, superivsor of track on Subdivision 20 of the River division of the New York Central, with headquarters at Weehawken, N. J., has been appointed assistant engineer of track, Lines Buffalo and East, with headquarters at New York, succeeding **Earl L. Wilson,** whose appointment to the position of supervisor of track is noted elsewhere in these columns.

W. F. Petteys, general foreman on the Eastern district of the Erie, with headquarters at Port Jervis, N. Y., has been promoted to assistant division engineer on the Western district, with headquarters at Salamanca, N. Y., succeeding **J. S. Parsons,** who has been transferred to the Eastern district, with headquarters at Buffalo, N. Y. Mr. Parsons succeeds **H. H. Clark,** who has been appointed inspector of transportation, as noted elsewhere in these columns.

William B. Barker, division engineer for the Southern Pacific of Mexico, with headquarters at Mazatlan, Sin., has been appointed acting chief engineer, succeeding **C. E. Cate,** transferred. **Rafael Ballesteros** has been appointed acting division engineer, Sonora division, succeeding **C. V. Chalk. Eduardo Fernandez** has been apointed acting division engineer, Sinaloa division, succeeding Mr. Barker.

William L. Seddon, chief consulting engineer for the receivers of the Seaboard Air Line, and vice-president and consulting engineer for the corporation, with headquarters at Norfolk, Va., has retired from active service. Mr. Seddon was born on October 14, 1862, in Stafford County, Va., and received his higher education at the University of Missouri. He entered railroad service in March, 1899, with the Seaboard Air Line, serving consecutively, until September, 1905, as in-

William L. Seddon

strumentman, resident engineer and assistant engineer. From September, 1905, to January, 1913, he was chief engineer of the road, and from the latter date until 1916, he was assistant to the president. Mr. Seddon was appointed vice-president in charge of operation in January, 1916, and the following year became general manager. He was appointed vice-president and consulting engineer of the railway corporation on March 1, 1920. Under the receivers, which were appointed on December 23, 1930, Mr. Seddon has been, in addition, chief consulting engineer for the receivers.

L. E. Gingerich, assistant division engineer of the New York division of the Pennsylvania, whose appointment as division engineer of the St. Louis division, with headquarters at Terre Haute, Ind., was reported in the June issue, was born on December 7, 1899, at York, Pa. Mr. Gingerich was educated at Gettysburg College, and entered railway service on December 4, 1922, as a rodman on the Pennsylvania at Jersey City, N. J. In September, 1926, he was advanced to assistant supervisor of track, and served in this position successively at Parkton, Md., and Lancaster, Pa. In July, 1928, he was further advanced to supervisor of track, serving in this position on the Williamsport division at Lock Haven, Pa., on the Philadelphia division at Middletown, Pa., and on the Baltimore division at Baltimore, Md. From May to November, 1934, Mr. Gingerich had charge of waterproofing, strengthening the track structure and increasing clearances and improving drainage in the tunnels of the Pennsylvania at Baltimore in preparation for electrified operation of the company's lines between New York and Washington. At the end of this period he was appointed assistant division engineer on the New York division, with headquarters at Jersey City, which position he was holding at the time of his recent appointment as division engineer.

P. Petri, engineer maintenance of way of the Eastern lines of the Baltimore & Ohio, with headquarters at Baltimore, Md., has been promoted to chief engineer maintenance of the entire system, succeeding **Earl Stimson,** whose death on May 27, is noted elsewhere in these columns. **C. B. Harveson,** division engineer of the Baltimore West End division, with headquarters at Baltimore, has been appointed engineer maintenance of way, Eastern lines, with headquarters, as before, at Baltimore, to succeed Mr. Petri. Mr. Harveson is succeeded as division engineer of the Baltimore West End division by **J. L. Maher,** division engineer of the Pittsburgh East End division, with headquarters at Connellsville, Pa., and **H. A. Lynch,** assistant division engineer of the Pittsburgh East End division, has been promoted to division engineer of that division, to succeed Mr. Maher.

Mr. Petri entered the service of the Baltimore & Ohio as an assistant engi-

P. Petri

neer in the construction department at Cincinnati, Ohio, on August 4, 1899. After having served in various capacities in that department and the real estate department, he became assistant division engineer of the Chicago division on September 1, 1906, becoming division engineer at Newark, Ohio, on January 20, 1907. He later served as division engineer of the Shenandoah, Ohio River, Connellsville and Cumberland divisions, until he was advanced to district engineer maintenance at Pittsburgh on September 1, 1915. From July 15, 1918, to March 16, 1919, Mr.

Petri was special engineer in the office of the assistant to federal manager at Baltimore. Next, he was division engineer on the consolidated territory of the Cumberland division, east and west ends, which, prior to that time was two divisions. Mr. Petri was promoted to engineer maintenance of way, Eastern lines, with headquarters at Baltimore, on September 20, 1926, which position he retained until his recent promotion.

Mr. Harveson was born on December 18, 1885, at Jacksonville, N. J., and received his higher education at Bucknell University. He entered railway service with the Philadelphia & Reading, at Philadelphia, Pa., in 1905, and in 1908 he became a draftsman with the same headquarters. In 1911 he was promoted to assistant engineer, and in 1914 he was appointed assistant supervisor, with headquarters at Trenton, N. J., being further promoted to supervisor in 1916, with

C. B. Harveson

headquarters at Olney, Pa. On June 26, 1917, he left the railroad to enter military service, in which he served as lieutenant, captain and major, Engineers, until July 19, 1919, when he returned to the Pennsylvania & Reading as a track supervisor. On July 1, 1922, he became a division engineer on the aBltimore & Ohio, with headquarters at Baltimore, where he was located at the time of his recent promotion.

A. W. White, division engineer of the Richmond division of the Chesapeake & Ohio, with headquarters at Richmond, Va., has been appointed to the newly-created position of engineer of track with jurisdiction over the entire system, with headquarters, as before, at Richmond, reporting to the engineer maintenance of way. **J. W. Knapp,** assistant division engineer of the Russell division, with headquarters at Russell, Ky., has been promoted to division engineer of the Richmond division, with headquarters at Richmond, succeeding Mr. White. Mr. Knapp has been succeeded by **P. L. Koehler,** assistant division engineer of the Huntington division, with headquarters at Huntington, W. Va., who has in turn been replaced by **S. E. Smithson,** assistant engineer on the Huntington division at Huntington. **F. P. Barrick,** supervisor of track, with headquarters as Louisa, Ky., has been appointed assistant division engineer of the Ashland division, with headquarters at Ashland, Ky., succeeding **L. T. Nuckols,** who has been promoted to division engineer of the Ashland division, with headquarters, as before, at Ashland. Mr. Nuckols succeeds **R. W. Mumford,** who has been transferred to the Huntington division, with headquarters at Huntington, W. Va., to succeed **M. I. Dunn, Jr.,** who has been promoted to trainmaster, as noted elsewhere in these columns.

Mr. White was born on January 18, 1884, at Louisville, Ky., and received his higher education at Valparaiso university, from which he was graduated in 1910. In September of that year he entered railway service with the Baltimore & Ohio and for three years was a rodman and a draftsman, then being promoted to supervisor of track, which position he held from 1913 to 1920. Between 1920 and 1925, he continued as supervisor, but with certain engineering responsibilities. On July 1, 1925, he left the Baltimore & Ohio to become an assistant division engineer on the Chesapeake & Ohio, being promoted to division engineer on September 8, 1930, the position he was holding at the time of his recent promotion to engineer of track.

Mr. Knapp was born on April 4, 1900, at Griffin, Ga., and received his higher education at the Virginia Military Institute from which he graduated in 1921. He entered railway service with the Chesapeake & Ohio on October 20, 1923, as a rodman in the engineering department, with headquarters at Richmond, Va., and one month later was promoted to instrumentman with the same headquarters. On June 10, 1925, Mr. Knapp was promoted to assistant cost engineer in the maintenance of way department, and on April 16, 1927, he was promoted to assistant division engineer. On January 1, 1929, he was appointed supervisor of track, and on July 8 of that year, he again became an assistant division engineer, with headquarters at Russell, Ky., where he was located at the time of his recent promotion to division engineer.

Mr. Smithson was born on September 8, 1902, at Hinton, W. Va., and entered railway service with the Virginian as a chainman in July, 1920, later serving as an instrumentman and office assistant on this road. In February, 1924, he left the Virginian to become a draftsman on the Chesapeake & Ohio, and in April, 1927, he was promoted to assistant engineer, the position he was holding at the time of his recent promotion to assistant division engineer.

Mr. Barrick was born on May 15, 1902, at Zanesville, Ohio, and entered railway service on June 23, 1924, as a chainman on the engineering corps of the Chesapeake & Ohio. On February 1, 1925, he was promoted to rodman, with headquarters at Richmond, Va., and on May 15 of that year he was promoted to transitman, with the same headquarters. On August 1, 1925, he was promoted to assistant engineer, with headquarters at Ashland, Ky., and on January 1, 1927, was promoted to assistant cost engineer, with the same headquarters. On May 15, 1929, he was promoted to supervisor of track with headquarters at Louisa, Ky., where he was located at the time of his recent promotion to assistant division engineer.

Mr. Nuckols was born on December 12, 1890, at Rockville, Va., and on July 1, 1907, he entered railway service as a chainman on the old South & Western railroad, now the Carolina, Clinchfield &

L. T. Nuckols

Ohio, on railroad location and construction, being advanced later to assistant resident engineer on construction. On August 1, 1910, he became a transitman on location with the Louisville & Nashville, and later was promoted to assistant resident engineer in the construction of the road's 1½-mile tunnel through Big Sandy ridge. Upon completion of this work in May, 1915, Mr. Nuckols accepted a position with the Interstate Commerce Commission, Division of Valuation, in which service he remained until October, 1916. He then became resident engineer in the construction department of the Chesapeake & Ohio, and on October 20, 1923, he was promoted to district engineer in charge of the Ashland construction district, with headquarters at Ashland, Ky. On January 1, 1932, he was promoted to resident engineer, with headquarters at Huntington, W. V., and on October 6, 1932, he was promoted to assistant division engineer in the maintenance of way department, with headquarters at Ashland, the position he was holding at the time of his recent promotion to division engineer.

Track

Albert Handley, a section foreman on the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Flat Rock, Ill., has been promoted to supervisor of track at Harrisburg, Ill., to succeed **J. P. Davis,** who has been transferred to Lynn, Ind., where he replaces **P. J. Reed,** supervisor of track at Arcanum, Ohio, who has retired.

J. W. Marks has been appointed track supervisor on the Alabama Great Southern (a unit of the Southern system), with headquarters at Chattanooga, Tenn., to succeed **C. E. Price,** who has been transferred to the Birmingham division of the Southern, with headquarters at Birmingham, Ala., to replace **O. L. Hitch-**

cock, who has been transferred on the same division and with the same headquarters. Mr. Hitchcock replaces **J. H. Butler,** who remains as supervisor on the Birmingham division at Birmingham in place of **F. H. Sims,** who has been transferred to the St. Louis-Louisville division, with headquarters at Huntingburg, Ind. Mr. Sims replaces **W. B. Earthman,** who has been transferred to Lawrenceburg, Ky., on the same division, to succeed **F. G. Birkla,** who remains as supervisor at Lawrenceburg in place of **W. C. Morris,** who has been transferred to the south end of the Cincinnati, New Orleans & Texas Pacific (part of the Southern system), with headquarters at Oakdale, Tenn., succeeding **A. C. Johnson.**

H. W. Manning, track supervisor on the Pennsylvania-Reading Sea Shore Lines, with headquarters at Camden, N. J., has been transferred to the Cincinnati division of the Pennsylvania, with headquarters at London, Ohio, to replace **A. H. Stimson,** who has been transferred to Derry, Pa.

R. H. Jordan has been appointed supervisor of Subdivision No. 3 of the Erie, with headquarters at Marion, Ohio, to succeed **F. W. Holland,** who has been transferred to subdivision No. 1, with headquarters at Kent, Ohio, to replace **D. A. Logan,** whose appointment as assistant division engineer is noted elsewhere in these columns.

L. T. Ferguson has been appointed roadmaster on the Nebraska division of the Union Pacific, with headquarters at North Platte, Neb., succeeding **R. A. Walker,** assigned to other duties. **W. F. Hart,** roadmaster of the Grand Island sub-division of the Kansas division at Marysville, Kans., has been transferred to the St. Joseph and Topeka sub-divisions of the same division, with the same headquarters, to succeed **J. Esse,** who has been transferred to succeed Mr. Hart.

Merle Carroll, assistant roadmaster on the Chicago & North Western at Milwaukee, Wis., whose promotion to roadmaster, with headquarters at Harvard, Ill., was noted in the June issue, was born on April 10, 1900, at Rolfe, Iowa. After leaving high school Mr. Carroll continued his studies through La Salle Extension University and the Railway Service Bureau. He entered railway service on May 1, 1922, as a laborer on the Chicago & North Western at West Chicago, being advanced to assistant foreman on November 1 of the same year and to foreman on April 1, 1923. Thereafter he served as an extra gang foreman and assistant foreman until December 29, 1933, when he was promoted to assistant roadmaster on the Wisconsin division, with headquarters at Milwaukee, Wis. On April 6, 1935, Mr. Carroll was further promoted to roadmaster on the same division, returning to the position of assistant roadmaster on August 1, 1935.

C. F. Edwards, assistant cost engineer on the Chesapeake & Ohio, has been promoted to supervisor of track, with headquarters at Louisa, Ky., succeeding **F. P. Barrick,** whose promotion to assistant division engineer is noted elsewhere in these columns. Mr. Edwards was born on June 1, 1898, at Coshocton, Ohio, and received his higher education at Denison University, from which he was graduated in 1922. He entered railway service on March 3, 1924, as a rodman on the system engineering corps of the Chesapeake & Ohio, and on February 1, 1925, he was promoted to instrumentman. In April, 1925, he was promoted to assistant engineer, and on October 1 of that year he was promoted to assistant cost engineer. On May 15, 1929, he was promoted to cost engineer on the Hocking Valley Railway (now part of the Chesapeake & Ohio) and on June 1, 1930, he became an assistant cost engineer on the C. & O., which position he was holding at the time of his recent promotion.

Ralph R. Lowe, who has been appointed roadmaster on the Terre Haute division of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Danville, Ill., was born on June 19, 1881, at Dale, Wis. He first entered railway service in June, 1904, with the Wisconsin & Northern (now part of the Minneapolis, St. Paul & Sault Ste. Marie) where he served successively as a rodman, instrumentman and resident engineer. In 1909 Mr. Lowe left this company to become a resident engineer with the Gogebic County (Mich.) highway department at Bessemer, Mich. Two years later he returned to railway service as an instrumentman on construction with the Chicago, Milwaukee, St. Paul & Pacific at Manilla, Iowa. In 1914 he returned to the Wisconsin & Northern, serving as a locating and resident engineer at Shawano, Wis. Three years later he again became connected with the Milwaukee as an instrumentman at Ottumwa, Iowa, being promoted to roadmaster, with the same headquarters, in 1928. From 1931 until the time of his recent appointment as roadmaster, Mr. Lowe served as an instrumentman and assistant engineer at Ottumwa.

A. M. Kennedy, assistant supervisor on the Maryland division of the Pennsylvania, has been promoted to supervisor on the same division, with headquarters at Perryville, Md., succeeding **W. C. Gretzinger,** who has been transferred to the Wilkes-Barre division, with headquarters at Wilkes-Barre, Pa. **H. M. Leppich** has been appointed assistant supervisor at Harrington, Del., to succeed **F. Aikman,** who has been transferred to Wilmington, Del. **D. W. Force** has been appointed assistant supervisor with headquarters at Harrisburg, Pa., to succeed **George Baylor,** who has been transferred to New York, where he succeeds **T. E. Boyle,** who has been promoted to supervisor on the Pennsylvania-Reading Seashore Lines, with headquarters at Camden, N. J. Mr. Boyle succeeds **H. W. Manning,** who has been transferred to London, Ohio.

Mr. Kennedy was born on April 19, 1905, at Cranford, N. J., and received his higher education in Brown Preparatory School, Philadelphia, and Carnegie Institute of Technology, from which latter institution he was graduated in 1927. He entered railway service on January 21, 1929, as an assistant in the engineering corps at Pittsburgh, Pa., and on May 1, 1930, was transferred to the Buffalo division, with headquarters at Dunkirk, N. Y. On November 1, 1930, he was transferred to the Eastern Ohio division, with headquarters at Mansfield, Ohio. On July 1, 1932, Mr. Kennedy was promoted to assistant supervisor of track, with headquarters at Buffalo, N. Y., and later served in this capacity at Rochester and Lewistown, Pa., and Wilmington, Del. He was located at Wilmington at the time of his recent promotion to supervisor.

Mr. Boyle was born on June 5, 1907, at Crawfordsville, Ind., and was graduated from Notre Dame university in 1928. In August of that year he entered railroad service with the Pennsylvania as an assistant on the engineering corps on the Toledo division, and in July, 1930, he was promoted to assistant supervisor on the Fort Wayne division. In October, 1931, he returned to the Toledo division as assistant on the engineering corps, and in March, 1932, he was transferred back to the Fort Wayne division. In May, 1932, he was appointed foreman on the Western Region welding train, and in September, 1933, he was promoted to assistant supervisor on the Columbus division. One month later, he was appointed acting supervisor on the Cincinnati division, and in January, 1934, he was transferred to the Indianapolis division. In April of that same year he became an assistant supervisor on the New York division, which position he was holding at the time of his recent promotion to supervisor at Camden.

Changes on the New York Central

Earl L. Wilson, assistant engineer of track on the New York Central, Lines Buffalo and East, with headquarters at New York, has been appointed supervisor of track on Subdivision 20 of the River division, with headquarters at Weehawken, N. J., succeeding **F. G. Smith,** whose appointment as assistant engineer of track is noted elsewhere in these columns.

F. L. Vault, Jr., chainman on the River division, with headquarters at Weehawken, N. J., has been appointed assistant supervisor of track on the St. Lawrence division, at Malone, N. Y., to succeed **J. B. Rutherford,** who has been transferred to the River division, at Weehawken, where he succeeds **R. L. Sahm,** Mr. Sahm has been transferred to the Eastern division, at Beacon, N. Y., to succeed **C. T. Gunsallus,** who has been promoted to track supervisor on Subdivision 16 of the St. Lawrence division, with headquarters at Richland, N. Y. Mr. Gunsallus succeeds **Ralph R. Smith,** who has been transferred to Subdivision 12 of the Buffalo division, with headquarters at Batavia, N. Y., where he replaces **T. J. Sexton,** who has been transferred to the Buffalo division, at Buffalo, N. Y., to fill the vacancy created by the death of **T. J. Dailey,** as noted elsewhere in these columns.

Mr. Gunsallus was born on December 6, 1899, at Beech Creek, Pa., and received his higher education at Pennsylvania State University, from which he was graduated with the degree of C. E. He started service with the New York Central on June 14, 1917, in the mechanical department, and, after holding several minor positions in the shops at Avis, Pa., until June 24, 1919, he became connected with the maintenance of way department

as a laborer. On March 16, 1920, he was appointed a chainman, and at the end of the same year became a rodman. On August 1, 1925, he was promoted to transitman on the Adirondack & Ottawa division, at Utica, N. Y., and on January 16, 1927, he was promoted to assistant track supervisor on the Syracuse division, at Charlotte, N. Y. On August 1, 1929, he was transferred to the River division, at Newburgh, N. Y., and on July 1, 1934, he was transferred to the Eastern division, at Beacon, N. Y., where he was located at the time of his recent promotion to supervisor.

Carl R. Swanson, extra gang foreman on the Pennsylvania division with headquarters at Lock Haven, Pa., has been promoted to assistant track supervisor on Subdivision 26 of the Pennsylvania division, with headquarters at Lock Haven, succeeding **G. V. Granlun,** who has been transferred to Subdivision 18 of the Buffalo division, with headquarters at Buffalo, to succeed **L. N. Johnson.** Mr. Johnson has been moved to the Pennsylvania division at Clearfield, Pa., to succeed **Carlisle Breth,** who has been transferred to the Eastern division, with headquarters at Brewster, N. Y. Mr. Breth succeeds **D. W. Johnston,** who has been transferred to Subdivision 2 of the Electric division, with headquarters at Spuyten Duyvil, N. Y., where he succeeds **H. V. Smith,** who has been promoted to supervisor of track, Subdivision 31, St. Lawrence division, at Tupper Lake Junction, N. Y. Mr. Smith succeeds **Carl A. Maxeimer,** who has been transferred to the Syracuse division, with headquarters at Syracuse, N. Y., to fill the vacancy created by the death of **G. J. Bowe,** as noted elsewhere in these columns.

H. V. Smith, who was promoted to supervisor, was born on July 19, 1894, at Newburgh, N. Y., and entered railway service on the New York Central as a laborer on April 13, 1910. He was appointed assistant foreman on May 1, 1915, and foreman on June 1, 1918. On December 16, 1924, he was promoted to assistant supervisor on the Adirondack division, with headquarters at Remsen, N. Y., and in 1925, was transferred to Fonda, N. Y., on the Mohawk division. In 1931, he was again transferred to Lyons, N. Y., on the Syracuse division, and in 1935, he was transferred to the Electric division at Spuyten Duyvil, N. Y., where he was located at the time of his recent promotion to supervisor.

Bridge and Building

J. B. Whiting, assistant engineer on the Missouri division of the Chicago, Rock Island & Pacific, with headquarters at Trenton, Mo., has been appointed master carpenter of the Kansas-St. Louis division, with headquarters at Kansas City, Mo.

Edgar M. Roberts, assistant bridge and building supervisor on the Cleveland, Cincinnati, Chicago & St. Louis, whose appointment as bridge and building supervisor with headquarters as before at Mt. Carmel, Ill., was reported in the June issue, was born on April 7, 1894, at Oxford, Pa. Mr. Roberts was graduated from the University of Maryland in 1915, and entered the service of the Big Four on December 13, 1918, as an assistant on the engineering corps at Indianapolis, Ind. During the following six years he held various positions in the engineering department on the Cleveland-Indianapolis division at Galion, Ohio; the Indianapolis Terminal division at Indianapolis, Ind.; the Chicago division at Indianapolis; the Cairo division at Mt. Carmel; and at Evansville, Ind., Danville, Ill., and Mattoon, Ill. On November 15, 1935, Mr. Roberts was advanced to assistant bridge and building supervisor on the Cairo division, holding this position until his recent appointment as bridge and building supervisor on the same division, which was effective on April 16.

Obituary

Charles A. Drawheim, roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Janesville, Wis., died in that city on June 25 as a result of an accident in a gravel pit.

G. J. Bowe, supervisor of track on the Syracuse division of the New York Central, with headquarters at Syracuse, N. Y., died in a hospital in that city on May 28. Mr. Bowe was born on October 12, 1876, at Jordon, N. Y., and entered railway service with the New York Central as a laborer on July 24, 1890, with headquarters at Jordon. On April 1, 1895, he was promoted to assistant foreman with the same headquarters, and on October 1, 1904, he was promoted to foreman. On February 15, 1912, he was promoted to general foreman, with headquarters at Frankford, N. Y. On August 19, 1912, he was promoted to assistant supervisor of track on the Mohawk division, with headquarters at Utica, N. Y., and on January 1, 1918, he was promoted to supervisor of track, with headquarters at Oswego, N. Y. On January 1, 1930, he was transferred to Rochester, N. Y., on the Syracuse division, and on August 1, 1935, he was transferred to Syracuse, where he was located at the time of his death.

T. J. Dailey, supervisor of track on the Buffalo division of the New York Central, with headquarters at Buffalo, N. Y., died at his home in Buffalo on May 31. Mr. Dailey was born on October 14, 1883, at West Batavia, N. Y., and entered railway service on the New York Central on April 1, 1898, as a laborer, at Crittenden, N. Y., and subsequently served as a car inspector until April 1, 1902, when he again became a track laborer, with headquarters at West Batavia. On February 1, 1903, he was promoted to section foreman, with headquarters at West Seneca, N. Y., and on April 1, 1904, he was promoted to worktrain foreman, with headquarters at Buffalo. On July 1, 1905, he was promoted to extra gang foreman, with the same headquarters, and on June 7, 1907, he was promoted to assistant supervisor of track, at Buffalo. On March 16, 1916, he was transferred to Newark, N. Y., on the West Shore Railroad, and on February 12, 1918, he was promoted to supervisor of track on Subdivision 8 on the Adirondack division, with headquarters at Remsen, N. Y. On October 1, 1920, he was transferred to the St. Lawrence division, and on January 1, 1932, he was again transferred to the Mohawk division at Selkirk, N. Y., on October 1, 1932, he was transferred to the Buffalo division, with headquarters at Buffalo, where he was located at the time of his death.

Earl Stimson, chief engineer maintenance of the Baltimore & Ohio, with headquarters at Baltimore, Md., died on May 27 of heart disease at a hospital in Massillon, Ohio, where he was taken after being stricken while on an inspection trip. Mr. Stimson had been in the service of the B. & O. for 41 years. He was born on September 2, 1873, at Cincinnati, Ohio, and received his higher education at Cornell university. He entered the service of the Baltimore & Ohio Southwestern (now the B. & O.) in June, 1895, as a rodman

Earl Stimson

in the maintenance of way department at Cincinnati, Ohio. In the following year he was advanced to assistant engineer at the same point, and in 1898, he was transferred to Chillicothe, Ohio. From 1899 to 1901, Mr. Stimson occupied the position of resident engineer on construction at Osgood, Ind., then being promoted to assistant division engineer at Chillicothe. In the following year he was further promoted to division engineer at Flora, Ill., later being transferred to Washington, Ind., and in 1905 he was made engineer maintenance of way, with headquarters at Cincinnati. His next promotion came in April, 1910, when he was made chief engineer maintenance of way, with headquarters at Baltimore. After two years in this capacity he was made engineer maintenance of way of the Eastern lines, with the same headquarters. From August, 1918, to March 1, 1920, during federal control of the railroads, Mr. Stimson held the position of general superintendent maintenance of way and structures of all lines under the jurisdiction of C. W. Galloway, federal manager. At the end of federal control he was appointed chief engineer maintenance of the B. & O., which position he held until his death.

Mr. Stimson had been active in the affairs of the American Railway Engineering Association, having served as its president in 1919-20, and as chairman of its Committee on Rail since 1927. It was under Mr. Stimson's leadership that the Committee on Rail initiated the arrange-

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ment with Dr. Elmer A. Sperry which led to the perfection of the transverse fissure detector car. It was also under his chairmanship that this committee developed the standard designs for 112-lb. and 131-lb. rail and fastenings and revised the specifications for rail.

J. G. Teders, assistant engineer on the Staten Island Rapid Transit Lines of the Baltimore & Ohio, with headquarters at Stapleton, S. I., N. Y., died on June 2, at West Brighton, S. I., following an illness of several months. He was born on March 8, 1875, at Avilla, Ind., and was educated in the public schools of that city and through subsequent correspondence courses in engineering. He entered railway service in 1899 with the B. & O., holding minor positions in the engineering corps in Indiana and Ohio until 1903, when he was appointed levelman, with headquarters at Medina, Ohio. In 1905, he was promoted to transitman and in 1906 he was further promoted to assistant resident engineer. In 1910 he was promoted to resident engineer and from that year until 1918, he was in responsible charge of construction projects at Wilmington, Del., Green Springs, W. Va., and Baltimore, Md. In 1918, he was promoted to assistant engineer, and in subsequent years had charge of large projects in or about Philadelphia, Pa., Baltimore, Germantown, Md., and on Staten Island. From 1928 to the time of his death, Mr. Teders was in full field charge of the extensive grade crossing elimination work being carried out on the Staten Island Rapid Transit Lines of the B. & O. on Staten Island, with headquarters at Stapleton, S. I.

Association News

American Railway Engineering Association

The Proceedings of the convention last March are now in the hands of the printer and it is expected that they will be ready for mailing about the middle of July.

John V. Neubert, chief engineer maintenance of way, New York Central, has been appointed chairman of the Rail committee, to succeed the late Earl Stimson, formerly chief engineer maintenance, Baltimore & Ohio.

Six committees held meetings during June, these being Rules and Organization, at Chicago, on June 12; Highways, at Chicago, on June 17; Shops and Locomotive Terminals, at Chicago, on June 23; Wooden bridges and Trestles, at the Forest Products Laboratory, Madison, Wis., on June 26; Economics of Railway Operation, at Toronto, Ont., on June 29 and 30; and Water Service, Fire Protection and Sanitation, at Atlantic City, N. J., on June 30 and July 1.

While a number of committees are planning to hold meetings in July, so far only four have selected dates and places for these meetings. These are Iron and Steel Structures, at Syracuse, N. Y., on July 8 and 9; Rail, at Chicago, on July 9; Buildings, at Chicago, on July 9 and 10; and Yards and Terminals, at Cleveland, Ohio, on July 13.

Bridge and Building Association

President T. H. Strate has called a meeting of the executive committee for Saturday, July 11, at which time the tentative reports of committees will be reviewed and arrangements made for the program for the convention that will be held in Chicago on October 20-22.

Wood Preservers Association

Approximately 30 members of the association, including members of the executive committee, met at Madison, Wis., on June 11. Following a meeting of the executive committee in the morning, the entire party spent the remainder of the day inspecting the new facilities of the Forest Products Laboratory, a large part of which are devoted to the preservation of wood. At the meeting of the executive committee, the organization of committees for the year was completed and other routine business transacted.

Roadmasters' Association

A meeting of the executive committee was held in Chicago on June 27, with President Armstrong Chinn, Treasurer E. E. Crowley, executive committee members R. H. Carter, A. H. Peterson and C. W. Baldridge, Past President Elmer T. Howson, Secretary T. F. Donahoe, Assistant Secretary C. A. Lichty, and Committee Chairman W. Lakoski in attendance, together with D. J. Higgins, secretary of the Track Supply Association. Mr. Lichty reported increasing interest in the convention. Mr. Higgins reported that the Track Supply Association now has applications for membership from as many companies as were represented at the last convention.

Metropolitan Track Supervisors' Club

Sixty members and guests atended the annual outing of the club at the Houvenkopf Country Club, near Suffern, N.Y., on Thursday, June 25. At the outing, which was also the last busines meeting of the club year, the following officers were elected for the ensuing year: President, I. D. Talmadge, roadmaster, New York, Ontario & Western; first vice-president, J. R. MacAsy, supervisor, Erie; second vice-president, J. P. Ensign, assistant division engineer, New York Central; and secretary-treasurer, G. M. Cooper, Ramapo Ajax Corporation (re-elected); members executive committee: I. D. Talmadge, president-elect; W. H. Haggerty, supervisor, New York, New Haven & Hartford, retiring president; Oscar Surprenant, roadmaster, Delaware & Hudson; W. M. Ryan, supervisor, Staten Island Rapid Transit Railway; and W. E. Gadd, Rail Joint Company.

Supply Trade News

Personal

Alex Chapman, district sales agent of the Rail Joint Company, with headquarters at Chicago, has been appointed western sales manager, with the same headquarters. **R. R. Seward,** district sales agent, with headquarters at New York, has been appointed eastern sales manager, with the same headquarters.

E. R. Packer has resigned as mechanical engineer with the **Q & C. Company,** New York, and has been appointed assistant to the president of **The Rails Company,** with headquarters at New Haven, Conn. Mr. Packer served apprenticeship in both shop and foundry practice and, in past years, has been consecutively, a draftsman, chief draftsman, estimator and sales engineer. For a number of years he has been identified with the railway supply business, specializing in locomotive, car and track devices, including snow flangers, plows, and electric heaters for railway switches and third rails.

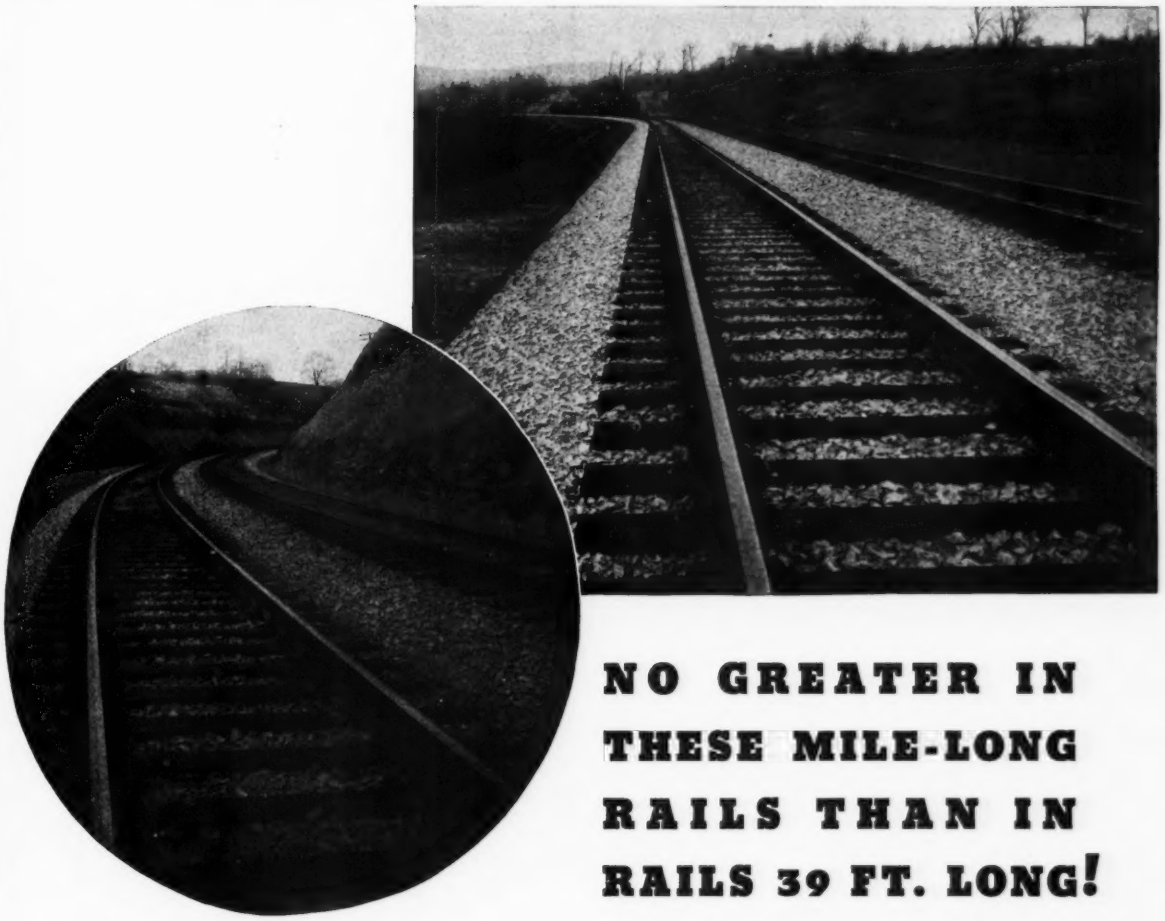
John C. Stewart, supervisor of insulation sales of the **United States Gypsum Company,** with headquarters at Chicago, has been promoted to manager of railroad sales, with the same headquarters,

John C. Stewart

the department being newly created to co-ordinate the merchandising and servicing of United States Gypsum products to railroads. Except for a short period, Mr. Stewart has been with the United States Gypsum Company in various sales capacities since 1916, when he entered its employ as a salesman in the southwest. From 1927 to 1930 he was associated with the **Stewart Inso Board Company,** St. Joseph, Mo., and when this company was taken over by the United States Gypsum Company in 1930 he resumed his duties with the latter company as a supervisor of insulation sales.

B. S. Spaulding, representative of Fairbanks, Morse & Co., Chicago, died in Rochester, Minn., on June 2.

EXPANSION *and* CONTRACTION?



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On the Delaware & Hudson Railroad, several installations of continuously welded rails, with M. & L. construction, have shown similar behavior over periods of two and three years.

Interest in continuous rails is growing by leaps and bounds. Important railroads throughout the country are becoming convinced both of the feasibility of welding rails into long, jointless stretches and of the tremendous savings made possible by the elimination of rail joints.

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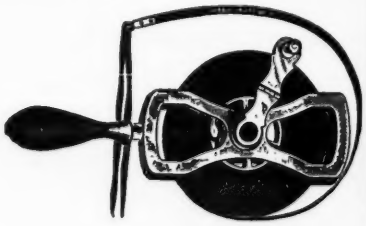

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"This means curtains, by sinko," screamed the roach. "We gotta get movin' fast."

"Fie, you're yellow," a young flea taunted the roach. "I've dodged too many squirts and jumped over too many powder traps to be skeered."

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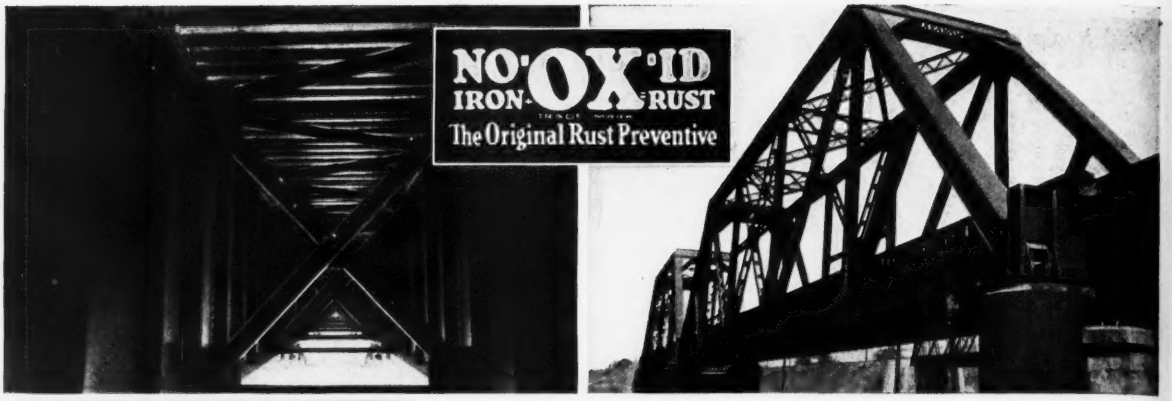

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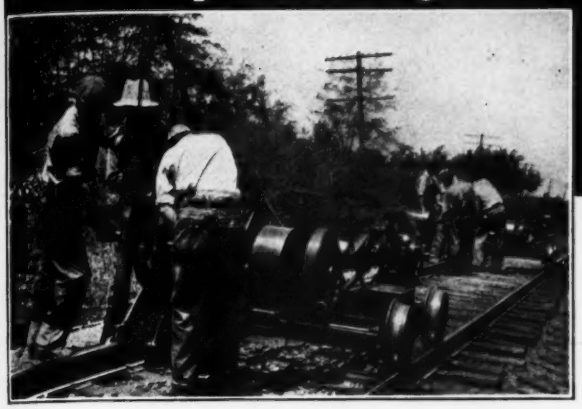
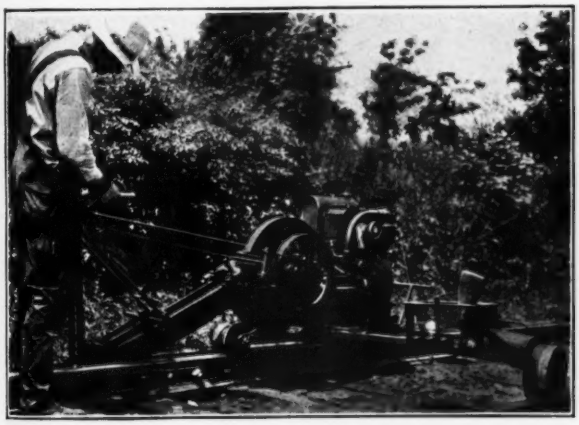


Two Nordberg Spike Pullers lead this rail laying gang.



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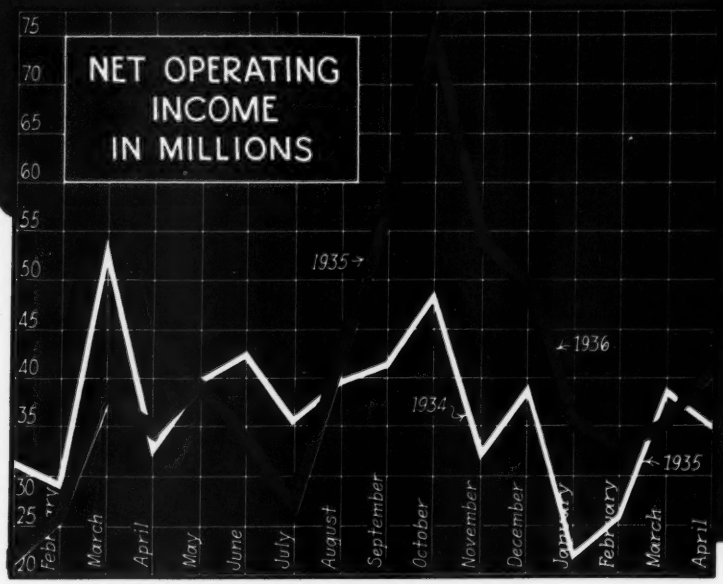

In the first seven months of 1935, net railway operating income *declined* $44,644,235.

Yet, in the next nine months (the latest for which figures are available), it was *larger* than in the corresponding period of any year since 1930—a gain over the previous year of $102,000,000, or 32 per cent. And it is still running at this five-year peak.

Increased earnings are leading to increased buying. Larger maintenance programs are the order of the day.

Railway purchases in the first six months of 1936 were the largest since 1930—they were 50 per cent larger than for the same period of 1935.

The roads have ordered 60 per cent *more* rail since October 1, 1935, than in the same period a year ago. Other maintenance of way materials and equipment are being ordered in increasing quantities.

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Are you including in your sales program a schedule in Railway Engineering and Maintenance that will keep your products throughout 1936 before those railway officers who are determining these programs and selecting the materials and equipment therefor?

1936